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CALENDAR

1923-24

First Term

1923			
Sept.	17,	Monday,	Entrance examinations begin.
Sept.	26,	Wednesday,	{ Registration and assignment of new students.
Sept.	27,	Thursday,	
Sept.	28,	Friday	Registration and assignment of old students.
Sept.	29,	Saturday,	Assignments concluded.
Oct.	1,	Monday,	Instruction begins at 8 a. m.
Oct.	19,	Friday,	Last day for payment of tuition fee for the first term.
Nov.	29,	Thursday,	Thanksgiving Day: <i>a holiday</i> .
Dec.	21,	Friday,	Instruction ends at 1 p. m.

Christmas Recess until Friday, Jan. 4, 1924, at 1 p. m.

1924			
Jan.	4,	Friday,	Instruction resumed at 1 p. m.
Jan.	11,	Friday,	FOUNDER'S DAY: <i>Convocation</i> .
Jan.	26,	Saturday,	Instruction ends.
Jan.	28,	Monday,	Term examinations begin.
Feb.	6,	Wednesday,	Term ends.
Feb.	7,	Thursday,	<i>A holiday</i> .

Second Term

Feb.	8,	Friday,	{ Registration of all students.
Feb.	9,	Saturday,	
Feb.	11,	Monday,	Instruction begins at 8 a. m.
March	3,	Monday,	Last day for payment of tuition fee for the second term.
April	2,	Wednesday,	Instruction ends at 1 p. m.

Spring Recess until Wednesday, April 9, at 1 p. m.

April	9,	Wednesday,	Instruction resumed at 1 p. m.
June	2,	Monday,	Term examinations begin.
June	10,	Tuesday,	End of term examinations.

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ESTHER ANTELL, Assistant in Economics.

DANIEL MILLER BOOTH, B.S. in E.E., Assistant in Physics.

HERBERT LEROY FANCHER, A.B., Assistant in the Romance Languages and Literatures.

GUY RAYMOND GILLETTE, Assistant in Chemistry.

CHARLES FRANCIS GILLIGAN, Assistant in Economics.

HAROLD ELLSWORTH GOLDSMITH, B.Chem., Assistant in Chemistry.

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DONALDSON WRIGHT KINGSLEY, A.B., Assistant in Histology and Embryology.

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RAYMOND HERBERT FLECKENSTEIN, B. Chem., Assistant in Chemistry.

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HENRY CLAY HOWELL, Assistant in Chemistry.

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MAGNUS G. SCHNECK, Assistant in Psychology.

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Regarding admission to the College of Arts and Sciences, the *General Circular of Information* should be consulted.

Two courses are offered in the College of Arts and Sciences, one leading to the degree of Bachelor of Arts, the other leading to the degree of Bachelor of Chemistry.

THE DEGREE OF BACHELOR OF ARTS

I. Requirements for Graduation

1. Credit for one hundred and twenty hours, of which at least ninety hours must be for courses given in the College of Arts and Sciences. (See also paragraph 20.)

2. A grade of C or better in at least sixty of the required one hundred and twenty hours. See Section IV (Marks).

3. Election of courses in accordance with Section III (Course of Study).

4. Completion of the work in Hygiene and Preventive Medicine and in Military Drill or in Physical Training prescribed by the University Faculty. (See page 63).

II. Special Provisions Regarding Credits toward Graduation

5. **In Summer Sessions.** To obtain credit by means of work done in summer sessions, a student must have previously satisfied the entrance requirements of the College and must obtain in advance the Dean's approval of his selection of courses. Credit for a maximum of thirty hours, but no more, may be secured in this way.

Credit will be allowed under the same restrictions for work done in summer sessions of other universities belonging to the Association of American Universities by a student regularly registered in this College, but permission to offer such credit must be obtained in advance from the Dean of this College.

6. **Admission to Advanced Standing.** A student admitted to the College of Arts and Sciences from another college of Cornell University or from any other institution of collegiate rank will receive credit toward the degree of Bachelor of Arts for the number of hours to which his records may, in the judgment of the Faculty, entitle him. In order, however, to obtain the degree of Bachelor of Arts he must, as a candidate for that degree, have been in residence at least two terms in the College of Arts and Sciences and in that college only.

7. **Registration in Two Colleges of the University.** A student who has completed at least ninety hours in courses given in the College of Arts and Sciences may, with the permission of the Faculties concerned, be registered both in the College of Arts and Sciences and also in any other college of Cornell University.

8. **Registration in the College and in the Graduate School.** A student who has satisfied all the academic requirements for graduation may, with the permission of the Graduate School, register both in the College of Arts and Sciences and in the Graduate School.

9. **Residence During the Last Two Terms.** The degree will not be conferred upon any student unless he has been in residence at Cornell University during the last two terms preceding graduation.

III. Course of Study

10. **Number of Hours.** A student must register in each term for at least twelve hours of work. No student may register for more than eighteen hours in any term except by permission of the Dean. A student who has not attained in any academic year a grade of C or better in a total of fifteen hours of work will not be permitted to elect more than fifteen hours of work in either term of the subsequent academic year. For registration in a course not in the College of Arts and Sciences the permission of the Dean of this College and of the Professor in charge of the course must be obtained. (See also paragraph ii under 12c below.)

11. **Prescribed Studies.** Prior to graduation a student must complete six hours in each of the following seven groups:

1. English and Public Speaking.
2. Foreign Languages.
3. History.
4. Chemistry, Mathematics, and Physics.
5. Anatomy, Biology, Botany, Entomology, Geology, Histology and Embryology, Physiology and Biochemistry, and Zoology.
6. Philosophy and Psychology, including Educational Psychology.
7. Economics and Government. (For the present Economics 51, five hours, will be accepted in satisfaction of this requirement.)

Students who entered the College prior to June 1922 may elect to satisfy the requirements for graduation in force at the time of their entrance.

12. Underclassmen.

a. **Underclass Requirements.** Before the end of the sophomore year each student is required to complete the first two groups mentioned in paragraph 11 above and at least eighteen of the required number of hours in the remaining five groups. Of these hours the student is required to take at least twelve and advised to take more, in his freshman year. Each six hours may be entirely in one division (for example, English six hours), or partly in one and partly in another (for example, English three hours and Public Speaking three hours). The following courses in foreign languages may not be applied in satisfaction of the foreign language requirement: Greek 1; Latin A, B; German 1, 1a, 3, 3a; French 1, 3, 3a; Spanish 1, 3; Italian, 1. College credit gained by examination at entrance may not be applied in satisfaction of any of these underclass requirements.

These requirements must be completed before a student may begin counting hours in an upperclass group. (See paragraph 13 below.)

b. **Underclass Advisers.** Freshmen and sophomores are under the jurisdiction of the Advisory Board for Underclassmen. Each freshman will be assigned to a member of the Faculty who will act as his adviser during his freshman and sophomore years. The function of the adviser is to assist the student in his choice of studies, to advise him during the term regarding his work, and generally to give him friendly counsel. The approval of the study card and the signature of the adviser must be obtained before the study card is filed at the office of the Dean.

c. **Courses Open to Freshmen.**

i. The following are the courses in the College of Arts and Sciences open to freshmen, except that,
a student may not register for any of these courses for which he has not satisfied the prerequisites, if any are specified (see announcement under each course).

A student may not register for any of these courses for which he has presented an acceptable equivalent at entrance.

Bibliography 1, 2	History 1, 31
Biology 1	Italian 1, 4
Botany 1	Latin A, B, 1, 2
Chemistry 101, 205, 210, 225, 875	Mathematics 1, 2, 3, 4, 5, 6, 7 (1), 7 (2), 15
English 1	Music 1, by examination, (See page 42)
Entomology 4, 5	Physics 3, 7, 10
French 1, 3, 4a, 4b, 5a, 5b	Physiology 3, 6
Geology 1, 1a, 2, 2a, 11, 21	Spanish 1, 3, 4a, 4b, 5a, 5b
German 1, 1a, 3, 3a, 4, 5, 8	Zoology 1, 5, 12
Greek 1, 2	

ii. Subject to the permission mentioned in paragraph 10, required courses in other colleges in the regular freshman schedule of those colleges may be elected by a freshman in the College of Arts and Sciences but only after first obtaining the approval of his adviser.

iii. Under exceptional circumstances, a freshman may by petition secure permission from the Advisory Board for Underclassmen to take courses (including freshman electives in other colleges) in addition to those allowed under i and ii.

13. **Upperclassmen.**

a. **Upperclass Requirements.** When a student has completed sixty hours including the underclass requirements (see paragraph 12a above) he may select an upperclass group. Prior to graduation he must complete at least twenty hours of work in the group selected, but courses marked with an asterisk (*) may not be counted toward this requirement. With the sanction of his adviser and of the Dean, a student may choose, instead of one of the upperclass group listed below, a combination of two related groups. A student registered in this college and in another college of Cornell University is excused from ten of these twenty hours. (See Paragraph 7.)

b. **Upperclass Advisers.** In choosing these twenty hours the student must obtain the advice and approval of some professor or assistant professor within the group who will sign the study card.

c. Upperclass Groups.

- | | |
|-----------------------------------|---|
| 1. Ancient Languages | 10. Mathematics |
| 2. Botany | 11. Philosophy and Education |
| 3. Chemistry | 12. Philosophy and Psychology |
| 4. Economics | 13. Physics |
| 5. English and Public Speaking | 14. Animal Biology (Physiology and Biochemistry, Anatomy, Histology, Embryology, Zoology, and Entomology) |
| 6. French and Italian | 15. Psychology and Education (including Physical Education) |
| 7. Geology and Physical Geography | 16. Spanish and Italian |
| 8. German | |
| 9. History and Government | |

d. Theses. During his last two terms of residence any candidate for the degree of Bachelor of Arts may, with the permission of the Dean, arrange with the Department in which he is taking his principal work to write a thesis which, if accepted, shall entitle him to not more than three hours of credit a term.

14. Filing of Study Cards. Students will file their study cards at the office of the Dean in accordance with instruction issued at the time of registration.

15. Changes in Study Cards. With the consent of the Dean and the approval of the adviser, a student may alter his list of courses in the first term during the first six days of instruction, and in the second term during the first day of instruction.

Thereafter, no student will be permitted to cancel his registration for any course in which he is registered, unless he shall previously have obtained from the Dean authorization to do so on the ground of ill health or for other reasons beyond the student's control.

IV. Marks

16. A, B, C, D are passing grades; E represents a condition; F a failure; Z dropping a course without official cancellation.

17. A student who in any course has received a term mark of E (a condition) or a mark of incomplete or of absent, may, with the consent of the Dean, and upon payment of the fee required by the University, be permitted to remove the mark by examination or otherwise as the department concerned may direct. A mark of conditioned or of incomplete or of absent may not be removed later than registration day of the third term of attendance in the University after the course was taken in class and not more than one attempt at removal will be allowed.

18. A student who has received a mark of F or Z in any course must reregister for it if he desires to secure credit for the course.

V. Continuance in the College

19. A student failing in any given term to pass twelve hours may not continue his work in the College except under such conditions and at such time as the Faculty may designate.

20. A student failing in the last term of his senior year to pass twelve hours—or, if in a summer session, four hours—may not be recommended for his degree except under such conditions and at such time as the faculty may designate.

21. A student's general record may be so unsatisfactory that the Faculty will refuse him permission to continue in the College even though he has passed twelve hours in the preceding term.

BACHELOR OF ARTS WITH HONORS

1. Any student in the College of Arts and Sciences who has completed four terms of residence with at least half of his work above C may apply for admission to candidacy for Honors in his upperclass group. A student who has maintained an exceptionally high standard of work during his third year of residence may be added to the list of candidates for Honors not later than the beginning of his seventh term of residence. A student may be dropped from the list of candidates for Honors for failure to maintain a satisfactory standard of work.

2. At the beginning of the first term of his candidacy, an applicant for admission to candidacy for Honors must file at the Dean's office, together with his study card, the written approval of at least two members of his upperclass group. In succeeding terms the candidate's course of study must also be approved by at least two members of his upperclass group.

3. A candidate for Honors may receive credit (in hours) in his upperclass group for additional work of a high order, which may or may not be in connection with regular courses of instruction.

4. General requirements:

(a) The ordinary requirements for the degree of Bachelor of Arts must be satisfied.

(b) The candidate must pass with grades of A or B a minimum of twenty hours in his upperclass group.

(c) The candidate for Bachelor of Arts with Honors must pass a comprehensive final examination in his chosen subject.

(d) The degree of Bachelor of Arts with Honors will be awarded only when recommended by not less than two members of the group in which the student is majoring.

5. Specific prerequisites for admission to candidacy and requirements for graduation with the degree of Bachelor of Arts with Honors have been set by the following departments or groups to members of which application should be made for more detailed information.

Ancient Languages

Greek. Prerequisite, Greek 1 and 2. Requirements: Twenty hours in Greek during the junior and senior years, a part of which may by agreement be satisfied by a thesis. Proficiency in some other foreign language or languages is expected.

Latin. Twenty hours of advanced work in Latin with grades of A or B. Proficiency in some other foreign language or languages is expected.

Classics. A minimum of fifteen hours of advanced work in Greek and fifteen hours of advanced work in Latin, with grades of A or B.

Semitics. General linguistic training. At least one year of Greek and one year of Latin taken in the University. Reading knowledge of German and French (or Italian). During the junior and senior years twenty hours are to be devoted to two or three of the Semitic languages including Arabic, and at least two hours a term to Oriental history.

Economics

Prerequisite, course 51. Requirements: A reading knowledge of one modern language by the beginning of the senior year.

Education

Prerequisite, A or B in Psychology 1 and Education 1 and approval of the instructor in these subjects. Students of Education preparing to teach special subjects must have approval of the instructors concerned. A student's main work is to be done under personal oversight of a member of the department.

English

Requirements: (1) Twenty hours of upperclass courses in the Department of English. (2) A knowledge of the general field of English literature and of certain selected masterpieces of ancient and modern languages, in translation if necessary. (3) The thorough study of one author, either in course or under the supervision of a member of the Department. The choice of author must be approved by the Committee on Honors. (4) Recommendation of three of the candidate's instructors in upperclass courses in English. Candidates for Honors in English are advised not to carry more than fifteen hours a term during their upperclass years. They may not at the same time be candidates for Honors in another subject.

Entomology

Requirements: courses 2, 3, 4, and 5, and fifteen additional hours in the department. Frequent personal conferences. Original investigation not extended but sufficient to give real contact with some unsolved problem.

Geology

Prerequisite, Chemistry 1 and Physics 1, or the equivalent. Geology 1 and one other elementary course in Geology. Reading knowledge of one foreign language. Requirements: Elementary courses not already covered in Mineralogy, Historic Geology, Economic Geology, and Physical Geography. Twenty-four hours in Geology in upperclass years with grades of A and B.

German

Prerequisite, courses 1 to 10; Latin (minimum course A); reading knowledge of one other modern foreign language, preferably French. Requirements: A special field or topic must be selected for detailed study.

Government

For prerequisite consult Department. Requirements: A reading knowledge of one modern foreign language by the beginning of the senior year.

History

Prerequisite, eight hours in History. Requirements: One modern foreign language by the senior year. General plan of work under the direction of the department.

Mathematics

Prerequisite, courses 1 to 8, or the equivalent. Requirements: Schedule of courses planned by Department for each student.

Philosophy

Prerequisite, at least one foreign language; six hours of Philosophy. Requirements: Thesis. Superior attainments in all subjects elected. Consult Department for detailed outline of required work.

Physics

Thirty hours in Physics of which twenty hours shall be such as to satisfy the requirements of a Major in Physics.

Physiology, Biochemistry, Anatomy, Histology and Embryology

Prerequisite, one or more courses in the Department with a grade of A. Requirements: High standard to be maintained in such advanced work as may be determined by the Department.

Psychology

Average grade of not less than B in courses 3 and 4 and in at least two of the courses 5, 6, 5a, and 6a. Satisfactory completion of an experimental investigation of a minor problem in Psychology.

Public Speaking

Requirements: Completion with distinction of eight or more courses (forty hours) approved by the Department, four in the Department and four chosen from auxiliary subjects. For six hours of this requirement special work in the history, literature, rhetoric, and psychology of Public Speaking may be substituted. Thesis.

Romance Languages

French. Prerequisite, courses 1 and 5. Requirements: Reading knowledge of Latin and German. Facility of expression in French. Minimum of twenty hours in advanced work in French and seventeen hours plus three hours of advanced work in an allied subject. When Honors are taken simultaneously in Italian or Spanish eight hours of French must be taken. All courses must be passed with grades of A or B. A special field or topic must be selected for detailed study.

Italian. Prerequisite, course 1. Requirements: Same as French.

Spanish. Same as French.

Zoology

Upperclass Major in Zoology together with elementary courses in the allied subjects of Histology, Embryology, Physiology, and General Entomology.

THE DEGREE OF BACHELOR OF CHEMISTRY

The degree of Bachelor of Chemistry will be awarded to those who have satisfactorily completed the following curriculum and the requirements prescribed by the University in Hygiene and Preventive Medicine and in Military Drill or in Physical Training.

Students who do not present, on entrance, at least two units of French and two units of German, will be required to make up the shortage before the beginning of the junior year. This may not be done, except with special permission of the Department, by taking University courses in French or German during the academic year.

CURRICULUM

First Year

		No. of Course	First Term	Second Term
Introductory Inorganic Chemistry	Chemistry	101	6	—
Introductory Qualitative Analysis	Chemistry	205	—	6
Analytic Geometry and Calculus	Mathematics	7	5	5
Introductory Experimental Physics	Physics	5	—	5
Drawing	Engineering	310	3	—
English	English	1	3	3

Second Year

Introductory Organic Chemistry	Chemistry	305	3	3
Organic Chemistry Laboratory	Chemistry	310	3	3
Introductory Quantitative Analysis	Chemistry	220	6	—
Introductory Chemical Spectroscopy	Chemistry	505		3
Gas and Fuel Analysis	Chemistry	250	4 or 0	0 or 4
Elementary Mineralogy	Geology	11	0 or 3	3 or 0
Heat and Light	Physics	8	2	—
Magnetism and Electricity	Physics	9	—	2
Physical Experiments	Physics	14	—	2

Third Year

Introductory Physical Chemistry	Chemistry	405	3	3
Physical Chemistry Laboratory	Chemistry	410	3	3
Advanced Inorganic Chemistry	Chemistry	130	3	3
Introductory Chemical Microscopy	Chemistry	530	3	—
Quantitative Analysis, Lectures	Chemistry	235	—	2
Advanced Quantitative Analysis	Chemistry	230	—	4
Physical Experiments	Physics	14	2	—
Elective	(at least)		4	4

Fourth Year

Introductory Industrial Chemistry	Chemistry	705	3	3
Seminary	Chemistry	905	—	1
Research for Seniors	Chemistry		4	4
Mechanical Laboratory	Engineering	367	—	4
Electrical Engineering	Engineering	E 12	4	—
Elective	(at least)		6	6

Candidates for the degree of Bachelor of Chemistry are required to take at least eight hours in research during the senior year in a division of the Department to be selected by the student. These divisions are: Inorganic Chemistry (Course 195); Analytical Chemistry (Course 295); Organic Chemistry (Course 395); Physical Chemistry (Course 495); Optical Chemistry (Course 595); Sanitary Chemistry (Course 695); Industrial Chemistry (Course 795); Agricultural Chemistry (Course 895).

The elective courses required in the curriculum may be chosen by the student, in each case with the approval of the Department of Chemistry, from the advanced courses in Chemistry, or from certain courses in other departments of the College of Arts and Sciences, or in other colleges of the University.

Students in the Course in Chemistry may register for 20 hours a term. To register for more than 20 hours, the student must first secure the consent of the Department.

THE HONOR CODE IN EXAMINATIONS

Under a constitution proposed and adopted by the students, and approved by the University Faculty on March 9, 1921, all students of Cornell University are put upon their honor with respect to their conduct in examinations and in other tests of work by which they are earning academic credit. The students have made themselves responsible for maintaining the code. For the trial of charges of breach of honor they elect committees of their own—a central committee for the University, and a committee in each of the colleges. Every student is expected to do his share in upholding the code, not only by honorable conduct on his own part, but also by refusal to conceal or condone fraud on another's part. A fraud observed in any college should be reported to a member of the student honor committee of that college.

COURSES OF INSTRUCTION

ANATOMY

21. Structure of the Human Body. Second term. Credit three hours. Professors KERR and PAPEZ. Lecture demonstrations, M W F, 11. *Stimson*.

For students in the biologic sciences and for others wishing to obtain a knowledge of the structure of their own bodies. Normal structure of the body together with its variations and evolution based on development in the individual and the race. Illustrated by specimens, lantern slides, and diagrams. Prerequisite, courses in zoology, biology, or physiology.

22. Anatomical Methods. First term. Credit three hours. Prerequisite, Zoology I. Previous work in comparative anatomy is also recommended. Professors KERR and PAPEZ, and instructors. Laboratory, any morning except Saturday.

***24. Art Anatomy.** Throughout the year. Credit three hours a term. One lecture and five hours of laboratory work a week. For students of drawing and art. Professor KERR. Lecture, Th 9. Laboratory hours to be arranged.

ASTRONOMY

181. General Astronomy. This course is continuous throughout the year and no credit will be allowed for the first term alone. Credit three hours a term. It is recommended that Physics 3 precede or accompany the course. Open to sophomores and upperclassmen. Professor BOOTHROYD. Section A, M W, 12, *Lincoln* 31; laboratory, Th, 7:30 p.m. *Observatory*. Section B, M F, 8, *Lincoln* 31; laboratory, W, 7:30 p.m. *Observatory*.

A study of the facts and principles of the science of astronomy together with a review of its historical development and accompanied by laboratory exercises in which the student is guided to a knowledge of the scientific method and its use in discovering some of the laws of nature, from observations of the orderly phenomena of the heavens.

For particulars concerning advanced courses in astronomy consult the *Announcement of the College of Engineering* and the *Announcement of the Graduate School*.

BIBLIOGRAPHY

1. Bibliography. First term. Credit two hours. Librarian AUSTEN. T Th, 12. *Library, Political Science Seminary Room*.

A study of the great group of books in a library and the ways of getting at their contents.

2. Bibliography. Second term. Credit two hours. Librarian AUSTEN. T Th, 12. *Library, Political Science Seminary Room*.

Writing and record making in ancient times. Printing and bookmaking in the Middle Ages. Lectures and reference reading. Open to freshmen who have had Course 1.

BIOLOGY

***1. General Biology.** Throughout the year. Credit three hours a term. First term prerequisite to the second; not open to students who have had college courses in Zoology and Botany. Lectures, M W, 9 or 11. *Roberts* 131. One practice period a week, T F, 8-10:30, or daily except S, 2-4:30. *Roberts* 302. Additional sections will be provided if necessary. All students must get their laboratory assignments in the Biology office, *Roberts Hall* 322, before instruction

*May not be counted for upperclass group.

begins. Professor NEEDHAM, Assistant Professor CLAASSEN, Mr. COWLES, and assistants.

An elementary course designed to acquaint the general student with the main ideas of biology through selected practical studies of the phenomena on which biological principles are based.

The work of this course begins with a study of the interdependence of organisms. This is followed by a study of the structure, physiology, and general behaviour of a series of plants and animals ranging from the simple to the more highly developed forms. The study of the simpler plants is closely associated with that of the simpler animals, to show common features in the development of plant and animal life. The plants which are next studied include the mosses, liverworts, ferns, and seed plants, and the animals include hydra, earthworm, and frog. This is followed by the consideration of organization and phylogeny, heredity and variation, natural selection and adaptation, segregation and mutation, the life cycle, metamorphosis and regeneration, and the responsive life of organisms. Laboratory fee, \$2.50 a term.

7. **Biology of the Human Species.** First term. Credit one hour. Lectures and classroom exercises. T Th, 11. *Roberts Hall* 392. Not open to freshmen. Should follow Biology I or equivalent. Professor NEEDHAM and Assistant Professor CLAASSEN.

BOTANY

Students wishing instruction in special groups of plants or in special subjects should consult the department.

*1. **General Botany.** Throughout the year. Credit three hours a term. Lectures, T Th, 9 or 11. *Dairy Building* 222. Laboratory, one period of two and one-half hours. *Stone*. Assignment to sections must be made at the time of registration. Professor PETRY, Dr. WANN, Miss FERNALD, Mrs. HABER, and Messrs. CLUM, WILSON, and MANNING.

This course is designed to furnish a general knowledge of the fundamental facts and principles of plant life. A careful study is made of form, structure, and reproduction of representatives from the principal groups, with a view to orient the student in the plant kingdom and to acquaint him with the principal evolutionary tendencies exhibited. Considerable attention will be given to life processes, particularly in the higher plants. Laboratory fee, \$2.50 a term; deposit, \$3, for first term only.

*2. **Trees and Shrubs.** First term. Credit three hours. Prerequisite, course 1 or its equivalent. Lecture, T, 8. *Stone* 192. Laboratory or field work, M W, or T Th, 2-4:30. One all-day field trip is required. *Stone, Botanical Laboratory*. Assignment to laboratory sections must be made in the Botany office at the time of registration. Dr. MUENSCHER.

A course dealing with the identification of trees and shrubs, both in summer and in winter condition. The laboratory work covering identification will be done largely in the field. The work of the latter part of the term will be a study of the taxonomy of woody plants. This course is adapted to the needs of all students wishing a detailed knowledge of trees and shrubs. Laboratory fee, \$3; deposit, \$3.

6. **Taxonomy of the Higher Plants.** Throughout the year. Credit three hours a term. Prerequisite, course 1 or its equivalent. Lecture, F, 8. Laboratory, M W, 2-5. *Stone, Botanical Laboratory*. Professor WIEGAND and Mrs. GRANT.

A study of the kinds of seed plants and ferns, their classification into genera, families, and orders, and field work on the local flora. Emphasis will be placed on wild plants, but the more common cultivated plants will receive some attention. The course is planned to follow course 1 and to furnish an introduction to the knowledge of the field botany and classification of the higher plants, in preparation for special work in various departments and as an aid in teaching. ~~It~~

*May not be counted for upperclass group.

struction will be given in the preparation of an herbarium and of keys. Laboratory fee, \$2 a term; deposit, \$3 second term.

9. **Histology.** First term. Credit four hours. Prerequisite, course 1 or its equivalent. Lecture, T, 12; laboratory, T Th S, 9-11:30. *Stone, Botanical Laboratory.* Professor EAMES and Mr _____.

This course is designed to give a working acquaintance with the internal morphology of vascular plants and emphasis is placed on practice in interpretation and determination of material. It is planned primarily for students in applied fields of botany, such as pathology, pomology, and genetics. Students desiring a general training in this subject should take course 14a.

[10. **Cytology.** Second term. Credit four hours. Prerequisite, Botany 1 or Zoology 1, and preferably Botany 14. Professor SHARP.] Not given in 1923-24.

11. **Methods in Histology and Cytology.** Second term. Credit one to three hours, depending on amount of work done. Prerequisite, course 1 or its equivalent. Laboratory, M W F, 9-12, with an occasional lecture during the laboratory period. *Stone, Botanical Laboratory.* Professor SHARP.

A course designed to acquaint the student with methods employed in preparing material for histological and cytological investigation. Laboratory fee, \$5.

[12. **Comparative Morphology of Algae.** Second term. Credit four hours. Prerequisite, course 1 or its equivalent. Professor SCHRAMM.] Not given in 1923-24.

14a. **Morphology of Bryophytes and Vascular Plants. Part I.** First term. Credit four hours. Prerequisite, course 1 or its equivalent. Lectures, M W, 9. Laboratory, M W, 10-12:30. *Stone 203.* Professor EAMES.

14b. **Morphology of Bryophytes and Vascular Plants, Part II.** Second term. Credit four hours. Prerequisite, course 1 or its equivalent. Lectures, T Th, 9. Laboratory, T Th, 10-12:30. *Stone 203.* Professor SHARP.

Courses 14a and 14b are designed for students who desire a single advanced course in the structure and development of plants above the Thallophytes. Part I deals chiefly with anatomical and histological features, the inclusion of fossil forms affording a broader basis for discussion of phylogeny. In Part II emphasis is placed on the morphology and cytology of reproduction in the various groups. Credit is given for either part separately, but for completeness both parts should be taken, with Part I first if possible. Laboratory fee, \$5 for each part.

20. **Plant Physiology.** First or second term. Credit four hours. Prerequisite, all freshman work or its equivalent, and course 1. Lectures and recitations, T Th, 10. *Stone 192.* Laboratory, T Th, 2-4:30 or W F, 2-4:30. *Stone 21.* Professor KNUDSON or Professor CURTIS, and Messrs. PROEBSTING, JONES, and CLUM.

This course is designed to acquaint the student with the general principles of plant physiology. Topics, such as water relations, photosynthesis, translocation, digestion, respiration, mineral nutrition, growth, and reproduction, are studied in some detail, and particular emphasis is placed, in both laboratory and recitations, on discussions of the principles taught and their applications. Laboratory fee, \$4; deposit, \$2.

21. **Plant Physiology, Advanced Lecture Course.** First and second terms. Credit three hours a term. Prerequisite, training in botany and chemistry, to be determined in each case by the department. Recommended for seniors and graduate students. Lectures, M W F, 10. *Stone 192.* Professor KNUDSON or Professor CURTIS.

22. **Plant Physiology, Advanced Laboratory Course.** First and second terms. Credit three hours a term. Must be preceded or accompanied by course 21. Laboratory, M, 2-5, S, 8-12:30. *Stone 21.* Professors KNUDSON and CURTIS, and Mr. PROEBSTING. Laboratory fee, \$5; deposit, \$2.

[30. **History of Botany.** Second term; without credit.] Not given in 1923-24.

33. **Special Problems in General Botany, Taxonomy, Histology, Cytology, and Algae.** Throughout the year. Credit not less than two hours a term. By appointment. Professors WIEGAND, PETRY, EAMES, and SHARP.

Students engaged in special problems or making special studies may register in this course. They must satisfy the instructor under whom the work is undertaken that they are prepared to successfully undertake the problem. The laboratory fee depends upon the nature of the work and the number of credit hours.

35. **General Department Seminary.** Throughout the year. Required of graduate students in these subjects. Hours to be arranged. Organized by Professor SHARP, assisted by other members of the department.

Broad problems pertaining to botany will be discussed, literature will be reviewed, and reports of research will be given.

36. **Seminary in the Taxonomy of Vascular Plants.** Throughout the year. Hours to be arranged. Professor WIEGAND.

A special seminary in topics of particular interest to the taxonomist. Current literature and current problems will form a portion of the program.

37. **Seminary in Morphology.** Throughout the year. Hours to be arranged. Professors EAMES and SHARP.

38. **Seminary in Plant Physiology.** Throughout the year. Required of graduate students taking work in the department. Conference, F, 11. *Stone* 192. Professor KNUDSON and CURTIS.

In the first term, topics for discussion will be chosen from current work in plant physiology. In the second term, special outlines will be followed and reports on research studies presented.

CHEMISTRY

All courses listed below are to be given in the new Laboratory of Chemistry.

INORGANIC CHEMISTRY

*101. **Introductory Inorganic Chemistry.** Lectures, recitations, and laboratory practice. Repeated in the second term. Credit six hours.

Lectures. *Main lecture room.* First term, two sections: T Th S, 11. Professor DENNIS. M W F, 11. Professor BROWNE. Second term, one section: M W F, 11. Professor BROWNE.

Recitations, one hour a week, to be arranged.

Laboratory sections: M F, 2-4:30; T Th, 2-4:30; W, 2-4:30, S, 8-10:30. Room 150. Professors DENNIS and BROWNE, Mr. MCKINNEY, and assistants.

Entrance credit in chemistry does not carry with it University credit in course 101. If a student entering the University from a preparatory school desires credit in course 101 he must pass an examination set by the Department of Chemistry. This examination is held in New York City and in Ithaca on the same day in September as the entrance examination. University credit in course 101 that is obtained by passing this examination does not carry with it entrance credit in chemistry.

Examinations for those who were unavoidably absent from the final examination in course 101 will be held at 2 p. m. on the day before instruction begins in the fall.

130. **Advanced Inorganic Chemistry.** Lectures. Throughout the year. Credit three hours a term. Open to those who have completed or are taking courses 405 and 410. M W F, 11. Room 107. Professor DENNIS.

Discussion of the chemical elements in the order in which they occur in the Periodic Table of Mendeléeff, with special attention to the group properties of the elements and to the relations of the groups to one another. The rare elements and the rare earths are treated in as great detail as are the more common elements.

*May not be counted for upperclass group.

135. Advanced Inorganic Chemistry. Laboratory practice. Either term. Credit one to six hours. Prerequisite, courses 305 and 310. Hours to be arranged. *Rooms* 178 and 122. Professors DENNIS and BROWNE, and assistants.

The study of the preparation, purification, properties, and reactions of inorganic compounds, including those of the rarer elements. Instruction is also given in the elements of glass blowing, for which one hour of credit is given.

Course 135 is designed to accompany course 130, but either course may be taken separately.

140. Selected Topics in Advanced Inorganic Chemistry. Lectures. Second term. Credit two hours. Open to those who have completed or are taking courses 405 and 410. T Th, 11. *Room* 107. Professor BROWNE.

The lectures for 1923-24 will deal chiefly with the hydronitrogens and their derivatives.

195. Research for Seniors. Throughout the year. See page xviii. Professors DENNIS and BROWNE.

ANALYTICAL CHEMISTRY

205. Introductory Qualitative Analysis. Lectures, recitations, and laboratory practice. Repeated in the second term. Credit six hours. Prerequisite, course 101.

Lectures, M W, 9. *Room* 107. Assistant Professor NICHOLS.

Recitations, one hour a week, to be arranged.

Laboratory section: M W, 2-5:45. *Room* 50. Assistant Professor NICHOLS, Mr. ———, and assistants.

The properties and reactions of the common elements, and of the common inorganic and organic acids; the qualitative analysis of a number of solutions and solid compounds.

Students in science are advised, and candidates for the degree of Bachelor of Chemistry are required, to take this course instead of course 210.

***210. Introductory Qualitative Analysis.** Shorter Course. Lectures and laboratory practice. Repeated in the second term. Credit three hours. Prerequisite, course 101.

Lecture, T, 12. *Room* 207. Mr. ———.

Laboratory sections: T Th, 8-11; T Th, 9-12; T Th, 2-5. *Room* 50. Mr. ——— and assistants.

The properties and reactions of the common elements and acids, and their detection in various liquid and solid mixtures.

[215. Advanced Qualitative Analysis. Laboratory practice. Repeated in the second term. Credit one, two, or three hours. Prerequisite, courses 220, 305, and 310. Assistant Professor NICHOLS.] Not given in 1923-24.

220. Introductory Quantitative Analysis. Lectures, recitations, and laboratory practice. Repeated in the second term. Credit six hours. Prerequisite, course 205.

Lectures, T Th, 9. *Room* 207. Assistant Professor NICHOLS.

Recitations, one hour a week, to be arranged.

Laboratory sections: first term, M T W, 2-5; T Th, 10-1, S, 9-12; second term, W Th F, 2-5; T Th, 10-1, S, 9-12. *Room* 252. Assistant Professor NICHOLS, Mr. BRANDES, and assistants.

The preparation and standardization of various volumetric solutions and their use in analyzing a variety of substances; gravimetric methods; stoichiometry.

Students in science are advised, and candidates for the degree of Bachelor of Chemistry are required, to take this course instead of course 225.

***225. Introductory Quantitative Analysis.** Shorter course. Lectures and laboratory practice. Repeated in the second term. Credit three hours. Open to those who have completed or are taking course 210.

*May not be counted for upperclass group.

Lecture, Th, 12. *Room 207.* Mr. **BRANDES**.

Laboratory sections: first term, Th F, 2-5; T Th, 9-12; second term M T, 2-5; T Th, 9-12. *Room 262.* Mr. **BRANDES** and assistants.

230. Advanced Quantitative Analysis. Recitations and laboratory practice. Repeated in the second term. Credit four hours. Prerequisite, course 220.

Recitation, one hour a week, to be arranged.

Laboratory periods: first term, M T W, 2-5:30, T Th, 9-1, S, 8-1; second term, M T W Th F, 2-5:30, T Th S, 8-1. *Rooms 277 and 294.* Students will be assigned to a combination of laboratory periods that will total ten hours a week. Assistant Professor **NICHOLS**, Mr. **BRANDES**, and assistants.

Gravimetric, volumetric, and electrolytic methods of analysis, and methods of combustion analysis; the calibration of weights and volumetric apparatus, analysis of iron and steel, alloys, silicates, etc.

235. Advanced Quantitative Analysis. Lectures. Second term. Credit two hours. Prerequisite, first term of course 405. M W, 12. *Room 207.* Assistant Professor **NICHOLS**.

Selected topics in advanced quantitative analysis; stoichiometry.

240. Electrochemical Analysis. Laboratory practice. Repeated in the second term. Credit one or two hours. Prerequisite, courses 230 and 405. Hours to be arranged. *Room 292 C.* Assistant Professor **NICHOLS** and Mr. **BRANDES**.

A study of the most approved electrochemical methods for the determination of silver, lead, copper, tin, nickel, cobalt, and zinc. Practice will be given in the analysis of alloys and ores.

245. Assaying. Lectures and laboratory practice. First term. Credit three hours. Prerequisite, course 225 (or 220), and if possible a course in mineralogy.

Lecture, M, 9. *Room 22.* Mr. **BRANDES**.

Laboratory section: M W 2-4:30. *Rooms B-91 and B-96.* Mr. **BRANDES** and assistant.

Lectures on the theory and practice of scorification and crucible assay, and on the metallurgy of copper, lead, zinc, silver, and gold. In the laboratory, practice is given in the assay of zinc, lead, copper, gold, and silver ores, mattes, and bullion. Designed for students in Chemistry and Geology, and as an elective in Mechanical and Civil Engineering.

250. Gas and Fuel Analysis. Lectures and laboratory practice. Repeated in the second term. Credit four hours. Prerequisite, Physics 3. Open to those who have completed or are taking course 220.

Lectures, M W, 11. *Room 207.* Assistant Professor **NICHOLS**.

Laboratory sections: M T, 2-4:30; T Th, 2-4:30; T Th, 10-12:30; S, 8-1. *Room 282.* Assistant Professor **NICHOLS** and assistants.

The complete analysis of coal gas, flue gas, and air; the determination of the heating power of gaseous, liquid, and solid fuels; the analysis of coal; standard methods of testing various petroleum and coal-tar products; the analysis of various substances by methods involving the use of different types of gas evolution apparatus. Problems are assigned which afford practice in the calculation and interpretation of results.

[**255. Advanced Gas Analysis.** Lectures. First term. Credit two hours. Prerequisite, course 250. Assistant Professor **NICHOLS**.] Not given in 1923-24.

260. Advanced Gas Analysis. Laboratory practice. Either term. Credit two hours. Prerequisite, course 250. Hours to be arranged. *Room 282.* Assistant Professor **NICHOLS** and assistants.

The use of special forms of apparatus and practice in the design and construction of apparatus for scientific investigation in this field.

Course 260 is designed to accompany course 255, but either course may be taken separately.

270. Special Methods of Quantitative Analysis. Laboratory practice. Either term. Credit two, three, or four hours. Prerequisite, courses 230 and 235. Hours to be arranged. *Room 277.* Assistant Professor NICHOLS and assistants.

Practice in the application of special methods such as indirect analysis, conductivity, electrometric titrations, etc. to quantitative analysis, and the analysis of special steels, ores, slags, alloys, etc.

Within certain limits the work may be selected to suit the requirements of the individual student.

295. Research for Seniors. Throughout the year. See page xviii. Assistant Professor NICHOLS.

ORGANIC CHEMISTRY

305. Introductory Organic Chemistry. Lectures and written reviews. Throughout the year. Credit three hours a term. Prerequisite, courses 210 and 225 (or 205 and 220). Open to those who are taking course 220. M W, 9. *Room 207.* F, 9. *Main Lecture Room.* Professor ORNDORFF.

The lectures discuss systematically the more important compounds of carbon, their occurrence, methods of preparation, relations, and uses.

310. Introductory Organic Chemistry. Laboratory practice and oral reviews. Throughout the year. Credit three hours a term. Open to those who have completed or are taking course 305. Laboratory sections: M T, 2-5:45; F, 2-5:45, S, 8-11:45. *Room 250.* Professor ORNDORFF, Mr. CORNWELL, and assistants.

The student prepares a large number of typical compounds of carbon and familiarizes himself with their properties, reactions, and relations. The detection of inorganic elements in organic compounds and the recognition of various groups of radicals, with the identification of unknown compounds, is included in the laboratory work.

315. Advanced Organic Chemistry. Lectures. Throughout the year. Credit two hours a term. Prerequisite, courses 305 and 310. T Th, 9. *Room 206.* Professor ORNDORFF.

A presentation of important chapters of organic chemistry and a discussion of classical researches in this field.

320. Advanced Organic Chemistry. Laboratory practice. Either term. Credit two to six hours a term. Open to those who have completed or are taking course 315. Hours to be arranged. *Room 208.* Professor ORNDORFF, Mr. CORNWELL, and assistants.

An advanced course in the preparation of organic compounds. The original literature is consulted, and, before taking up original work in this field, the student is required to repeat some extended and important piece of work, and to compare his results with those published.

325. The Coal Tar Dyestuffs. Lectures. First term. Credit one hour. Open to those who have completed or are taking course 315. F, 11. *Room 206.* Professor ORNDORFF.

Discussion of methods of manufacture of intermediates and dyestuffs and of their properties, constitution, and relationships. The treatment is scientific rather than technical.

330. The Coal Tar Dyestuffs. Laboratory practice. Either term. Credit two to four hours a term. Open to those who have completed or are taking course 325. Hours to be arranged. *Room 208.* Professor ORNDORFF and Mr. CORNWELL.

Preparation of various intermediate products used in the manufacture of dyes, and of representatives of the different groups of dyestuffs.

335. Stereochemistry. Lectures. Second term. Credit one hour. Prerequisite, course 305. F, 11. *Room 206.* Professor ORNDORFF.

The stereochemistry of the compounds of carbon and nitrogen. The necessity

of considering the space relations of the atoms in certain classes of isomers is shown and the close agreement of facts and theory is brought out.

340. Methods of Organic Analysis. Laboratory practice. Either term. Credit two to six hours a term. Prerequisite, courses 305 and 310. Hours to be arranged. *Room* 208. Professor ORNDORFF and Mr. CORNWELL.

Practice in the qualitative and quantitative analysis of commercial organic products such as alcohols, ethers, organic acids, glycerin, formalin, acetates, coal tar distillates, petroleum products, soaps, acetanilide, etc.

375. Elementary Organic Chemistry. Lectures, written reviews, and laboratory practice. First term. Credit, lectures and written reviews only, four hours; with laboratory, five to six hours. Students who are preparing for the study of medicine must take the whole six hours. Prerequisite, courses 210 and 225 (or 205 and 220). Open to those who are taking course 220.

Lectures and written reviews, M W F S, 12. *Main Lecture Room.* Mr. CORNWELL.

Laboratory section and oral reviews. M W, 2-4:30. *Room* 250. Mr. CORNWELL and assistants.

395. Research for Seniors. Throughout the year. See page xviii. Professor ORNDORFF.

PHYSICAL CHEMISTRY

405. Introductory Physical Chemistry. Lectures. Throughout the year. Credit three hours a term. Prerequisite, course 305 (or 375) and Physics 2 and 8. M W F, 9. *Room* 7. Assistant Professor BRIGGS.

A systematic presentation of modern chemical theory in which special attention is paid to the following topics; Gases, liquids, and solids; the theory of solution; reaction velocity, catalysis, and chemical equilibrium; the Phase Rule; colloid chemistry; thermochemistry; and elementary electrochemistry. Problems in physical chemistry.

It is advisable, but not obligatory, that course 410 accompany this course.

410. Introductory Physical Chemistry. Laboratory practice. Throughout the year. Credit three hours a term. Open to those who have completed or are taking course 405. Laboratory sections: M T, 2-4:30; Th F, 2-4:30; S, 8-1. *Room* 1. Assistant Professor BRIGGS and assistants.

Qualitative and quantitative experiments illustrating the principles of physical chemistry and including practice in performing physical chemical measurements. An important feature of this course is the presentation of detailed reports based upon data obtained in the laboratory.

[**415. Advanced Physical Chemistry.** Lectures. Throughout the year. Credit two hours a term. Prerequisite, course 405. Professor BANCROFT.] Not given in 1923-24.

430. Applied Colloid Chemistry. Lectures. Throughout the year. Credit two hours a term. Open to candidates for the degree of Bachelor of Chemistry if they have completed course 405; to others only by special permission. T Th, 10. *Room* 7. Professor BANCROFT.

The theory of colloid chemistry and its application in the arts.

450. Applied Electrochemistry. Lectures. Throughout the year. Credit two hours a term. Prerequisite, course 405. M W, 11. *Room* 7. Assistant Professor BRIGGS.

The theory of electrolysis and electromotive force; electrolytic extraction and refining of metals; electrolytic manufacture of organic and inorganic compounds; theory and practice of storage cells; preparation of compounds in the electric furnace. Problems in electrochemistry.

455. Applied Electrochemistry. Laboratory practice. Throughout the year. Credit two hours a term. Open to those who have completed or are taking course

450. Hours to be arranged. *Room* 1-A. Assistant Professor BRIGGS and assistant.

Qualitative and quantitative study of electrolysis; determination of electrical conductivity; potentiometric measurements; hydrogen ion concentration; determination of current and energy efficiencies in electrolytic and electrothermal work; electrolytic preparation of organic and inorganic compounds; tests of storage cells; preparation of compounds in the electric furnace; measurement of furnace temperatures.

460. **Theoretical Electrochemistry.** Lectures. Throughout the year. Credit two hours a term. Prerequisite, course 405. T Th, 11. *Room* 22. Professor BANCROFT.

The historical development of the subject with special reference to the theory of the voltaic cell. For advanced students in Chemistry or Physics.

465. **Advanced Physical Chemistry.** Laboratory practice. Either term. Credit not to exceed six hours a term. Prerequisite courses determined in each case by the professor in charge. Hours and work to be arranged. *Room* 94. Professor BANCROFT, Assistant Professor BRIGGS, and assistants.

Students may elect in mass law, reaction velocity, or efficiency measurements with special reference to course 415; in photo-chemistry, photography, or colloid chemistry with special reference to course 430; in conductivity, or electrometric determinations with special reference to course 460; in electrolytic, or electric furnace products with special reference to course 450; in the application of physical chemical methods to organic chemistry.

495. **Research for Seniors.** Throughout the year. See page xviii. Professor BANCROFT and Assistant Professor BRIGGS.

OPTICAL CHEMISTRY

505. **Introductory Chemical Spectroscopy.** Lectures, written reviews, and laboratory practice. Repeated in the second term. Credit three hours. Prerequisite, courses 210 and 225 (or 205 and 220). Open to those who have completed or are taking Physics 8.

Lectures and written reviews, T Th, 8. *Room* 377. Dr. PAPISH.

Laboratory sections: M T W Th F, 2-4:30, S, 8-10:30. *Rooms* 392 and 396. Dr. PAPISH and assistants.

The construction and the use in chemical analysis of the spectroscope, polariscope, refractometer, colorimeter, and nephelometer. The laboratory instruction is devoted to the training of the student in the use of these instruments in the solving of chemical problems.

510. **Advanced Chemical Spectroscopy.** Laboratory practice. First term. Credit two or more hours. Prerequisite, course 505. Hours to be arranged. *Room* 396. Dr. PAPISH and assistants.

The study of arc, spark, and absorption spectra and the application of spectroscopic methods to the identification of dyestuffs. Practice in one or more of the subjects mentioned may be selected by the student.

520. **Spectrographic Methods.** Laboratory practice. Either term. Credit one or more hours. Prerequisite, course 505. Hours to be arranged. *Room* 396. Conference, Th, 12. *Room* 377. Dr. PAPISH.

The application of photographic methods to arc, spark, and absorption spectroscopy. Practice is also given in the application of ultra-violet spectroscopy in chemical analysis.

[525. **Special Methods in Optical Chemistry.** Lectures, demonstrations, and laboratory practice. First term. Credit two hours. Prerequisite, course 505. Dr. PAPISH.] Not given in 1923-24.

530. **Introductory Chemical Microscopy.** Lectures and laboratory practice. Repeated in the second term. Credit three hours. Prerequisite, courses 210 and 225 (or 205 and 220), and Physics 8.

Lecture, first term, M, 12; second term, M, 10. *Room 377.* Professor CHAMOT.

Laboratory sections: M T, 2-4:30; T Th, 10-12:30; Th F, 2-4:30. *Room 378.* Professor CHAMOT, Mr. MASON, and assistants.

The use of the microscope and its accessories; microscopic methods as applied to chemical investigations; micrometry; the examination of crystalline compounds; recognition of textile and paper fibers, etc. The application of microscopic methods to quantitative analysis.

535. Advanced Chemical Microscopy. Laboratory practice. First term. Credit three or more hours. Prerequisite, course 530. Laboratory periods: M T Th F, 2-5, T Th, 10-1. *Room 378.* Conference T, 12. *Room 377.* Professor CHAMOT, Mr. MASON, and assistants.

Practice in the examination and analysis of inorganic substances containing the more common elements with special reference to rapid qualitative methods and to the analysis of minute amounts of material.

540. Advanced Chemical Microscopy. Laboratory practice. Second term. Credit two hours. Prerequisite, course 530. Hours to be arranged. *Room 378.* Professor CHAMOT, Mr. MASON, and assistants.

Organic qualitative microscopic analysis as applied to the detection of common commercial organic compounds, vegetable alkaloids, "strong drugs," etc., with particular emphasis upon the analysis of minute quantities of material.

In this course work may be elected in the microscopy of textile or paper fibers.

542. Special Methods in Chemical Microscopy. Lectures and demonstrations. Second term. Credit two hours. Prerequisite, course 530. W F, 9. *Room 377.* Professor CHAMOT and Mr. MASON.

A discussion of microscopic methods as applied to the solution of industrial and research problems. Microscopes of special and unusual construction, such as ultramicroscopes, supermicroscopes, luminescence microscopes, long distance microscopes, etc.; their uses and their limitations.

545. Microscopy of Commercial Alloys. Laboratory practice. Second term. Credit two hours. Prerequisite, course 530. *Room 384.* Hours to be arranged. Professor CHAMOT and assistants.

An introduction to the methods employed in the microscopic examination of metals, alloys, and other metallurgical products; practice in grinding, polishing, and etching specimens for microscopic study; metallographic microscopes and their use.

This course may be extended to include other materials of construction.

550. Microscopy of Foods and Beverages. Laboratory practice. Second term. Credit two hours. Prerequisite, course 530. Hours to be arranged. *Room 378.* Conference T, 12. *Room 377.* Professor CHAMOT, Mr. MASON, and assistants.

The application of microscopic methods to the examination of foods and beverages for the purpose of ascertaining their purity and for the detection of deteriorations, adulterations, and admixtures.

555. Introductory Photomicrography. Laboratory practice. Second term. Credit two or more hours. Prerequisite, course 530. Professor CHAMOT.] Not given in 1923-24.

595. Research for Seniors. Throughout the year. See page xviii. Professor CHAMOT and Dr. PAPISH.

SANITARY CHEMISTRY

605. Introductory Sanitary Chemistry (Foods). Lectures. First term. Credit two hours. Prerequisite, course 305 (or 375). T Th, 11. *Room 377.* Dr. GEORGIA.

Chemistry of foods, beverages, and food accessories; special apparatus; adulteration and misbranding, sweeteners, preservatives, food colors, food poison-

ings, and methods for their detection. Relation of the chemical composition of materials used in the household to the public health. Garbage disposal.

It is advisable, but not obligatory, that course 610 accompany this course.

610. Introductory Sanitary Chemistry (Foods). Laboratory practice. First term. Credit two hours. Open to those who have completed or are taking course 605. Laboratory sections: M T, 2-4:30; Th F, 2-4:30. *Room 352.* Dr. GEORGIA and assistant.

Laboratory exercises designed to illustrate the material presented in course 605. General and special methods of analysis of foods, beverages, and food accessories with special references to the detection of adulteration. The use of saccharimeters, refractometers, cryoscopes, muffle furnaces, vacuum ovens, etc.

615. Introductory Sanitary Chemistry (Water). Lectures. Second term. Credit two hours. Prerequisite, course 305 (or 375). T Th, 11. *Room 377.* Dr. GEORGIA.

Pollution of water; physical, chemical, bacteriological, and microscopical examination of water for household and municipal purposes; examination of sewage and sewage effluents; introduction to the methods of water purification, water softening, and sewage disposal, and their control. Interpretation of analytical results and the preparation of sanitary surveys.

It is advisable, but not obligatory, that course 620 accompany this course.

620. Introductory Sanitary Chemistry (Water). Laboratory practice. Second term. Credit two hours. Open to those who have completed or are taking course 615. Laboratory sections: M T, 2-4:30; Th F, 2-4:30. *Room 352.* Dr. GEORGIA and assistant.

Laboratory exercises designed to illustrate the material presented in course 615.

630. Advanced Sanitary Chemistry (Water). Lectures and conferences. First term. Credit two hours. Prerequisite, course 615. T Th, 9. *Room 377.* Dr. GEORGIA.

Sources of water; methods of water purification, sedimentation, filtration, disinfection; control of water purification; tastes and odors and their control; boiler waters and water softening; iron removal; deactivation of waters; methods of sewage disposal and control.

Laboratory practice to accompany this course may be elected under course 635.

635. Advanced Sanitary Chemistry. Laboratory practice. Either term. Credit two or more hours. Prerequisite, course 610 or 620. Hours to be arranged. *Rooms 352, 356, 358.* Dr. GEORGIA and assistant.

Students who have had adequate preparation may elect work in any branch of sanitary chemistry. Among others, work along the following lines may be taken:

The bacteriology of water.

Continuation of work offered in courses 610 or 620.

The control of water purification.

Water softening.

Disinfectants, etc.

The work in many cases may be arranged to meet the needs of the individual student.

640. Sanitary Chemistry (Disinfectants). Lectures. Second term. Credit two hours. Prerequisite, course 305 (or 375). T Th, 9. *Room 377.* Dr. GEORGIA.

Standardization, chemical properties, methods of application, and proper choice of disinfectants and other agents used in combating the spread of disease.

695. Research for Seniors. Throughout the year. See page xviii. Professor CHAMOT and Dr. GEORGIA.

INDUSTRIAL CHEMISTRY

705. Industrial Chemistry. Lectures. Throughout the year. Credit three hours a term. Prerequisite, course 405. M W F, 10. *Room 177.* Professor RHODES.

A discussion of various typical processes of chemical manufacturing from the standpoint of: (a) available materials, their properties and limitations; (b) standard forms of apparatus used in chemical manufacturing; (c) properties and specifications of commercial chemicals; (d) computation of costs and profits in chemical manufacturing.

By special permission, candidates for the degree of Bachelor of Chemistry may be permitted to register for course 705 in their junior year and to postpone a part of their elective hours until the senior year.

710. Industrial Chemistry. Laboratory practice. Second term. Credit two, three, or four hours. Prerequisite, course 405. Hours to be arranged. *Room B-78.* Professor RHODES and assistant.

The study in the laboratory, on a semi-plant scale, of processes and materials used in the chemical industries.

715. Selected Topics in Industrial Chemistry. Lectures. Second term. Credit one hour. Open to students who have completed or are taking course 705. *F, 11. Room 177.* Professor RHODES.

A discussion of special topics in industrial chemistry. The lectures in 1923-24 will deal with the theory of fractional distillation and with the applications of fractional distillation to industrial processes.

720. Bitumens. Lectures. Second term. Credit two hours. Open to students who have completed or are taking course 705. *M W, 11. Room 177.* Professor RHODES.

(Under the term "bitumen" as here used are included petroleum, native asphalts, and asphaltites, oil shales, and coal tar and other tars.)

The refining of petroleum; the manufacture of road tars, pitches, oils, and naphthas; the preparation of refined naphthas; tar acids; naphthalene, and other refined coal-tar products; the distillation of oil shales; and the preparation and utilization of asphalts and asphalt products.

725. The Chemistry of Fuels. Lectures. First term. Credit two hours. Open to students who have completed or are taking course 705. *M W, 11. Room 177.* Professor RHODES.

The chemistry of coal, coke, and the fuel gases. Particular stress is laid upon the chemistry of the carbonization of coal and upon the applications of physical chemistry to the reactions involved in the manufacture and purification of the fuel gases.

***775. Engineering Chemistry.** Lectures. Repeated in the second term. Credit two hours. Prerequisite, course 101. Not open to students who are candidates for the degree of Bachelor of Chemistry. *M W, 8. Main Lecture Room.* Professor RHODES.

Chemistry in its relations to engineering.

776. Chemistry of Pulp and Paper. Lectures. Second term. Credit two hours. Prerequisite, course 775. Open to students in Forestry, to others only by special permission. *T Th, 10. Room 177.* Professor RHODES or———.

The chemistry of the manufacture of pulp and paper.

795. Research for Seniors. Throughout the year. See page xviii. Professor RHODES.

AGRICULTURAL CHEMISTRY

805. Introductory Agricultural Chemistry (Fertilizers, Insecticides, Soils). Lectures. First term. Credit two hours. Prerequisite, course 305. *T Th, 9. Room 107.* Professor CAVANAUGH.

The relation of chemistry to agriculture and an introduction to the study of plant growth; the composition and chemical properties of soils, fertilizers, amendments, insecticides, and fungicides.

*May not be counted for upperclass group.

810. Introductory Agricultural Chemistry. Laboratory practice. First term. Credit two hours. Open to those who have completed or are taking course 805. Laboratory section: M W, 2-4:30. Room 350. Assistant Professor RICE and assistant.

815. Introductory Agricultural Chemistry (Foods and Feeds). Lectures. Second term. Credit two hours. Prerequisite, course 305. T Th, 9. Room 107. Professor CAVANAUGH.

Discussion of the sources, chemical composition, and properties of the principal foods and feeds such as cereals, fruits, animal products, and dairy products. Relation of methods of preservation and manufacture to the nutritive value of foods.

820. Introductory Agricultural Chemistry. Laboratory practice. Second term. Credit two hours. Open to those who have completed or are taking course 815. Laboratory section: M W, 2-4:30. Room 350. Assistant Professor RICE and assistant.

The Methods of the Association of Official Agricultural Chemists are used in the examination and analysis of foods and feeding stuffs, such as milk and milk products, cereal products, canned vegetables, etc.

[835. Advanced Agricultural Chemistry. Laboratory practice. Either term. Credit two or more hours. Prerequisite, course 810. Professor CAVANAUGH and Assistant Professor RICE.] Not given in 1923-24.

[840. Advanced Agricultural Chemistry. Laboratory practice. Either term. Credit two or more hours. Prerequisite, course 820. Professor CAVANAUGH and Assistant Professor RICE.] Not given in 1923-24.

***875. Elementary Agricultural Chemistry.** Lectures and recitations. Second term. Credit four hours. Prerequisite, course 101. Not open to students who are candidates for the degree of Bachelor of Chemistry.

Lectures, M W F, 11. Room 377. Professor CAVANAUGH.

Recitations, one hour a week, to be arranged. Professor CAVANAUGH, Assistant Professor RICE, and Mr. _____.

The relation of chemistry to agriculture, and an introduction to the study of the composition and chemical properties of plants, fertilizers, feed stuffs, insecticides, and fungicides.

***880. Elementary Chemistry of Food Products.** Lectures. Second term. Credit three hours. Prerequisite, course 101. Not open to students who are candidates for the degree of Bachelor of Chemistry. M W F, 11. Room 22. Assistant Professor RICE.

The chemical composition, chemical properties, and sources of the principal foods and food products. Special attention is given to the chemistry of milk products, cereal products, sugars, and fruits.

Intended for students in Home Economics and students in the College of Agriculture.

895. Research for Seniors. Throughout the year. See page xviii. Professor CAVANAUGH and Assistant Professor Rice.

SEMINARY

905. Seminary. Credit one hour. M, 5. Room 107. For seniors who are candidates for the degree of Bachelor of Chemistry.

ECONOMICS

Upperclass Group. Course 51 or its equivalent must be completed before any credit may be obtained toward the upperclass requirement. No upperclass credit will be allowed for either course in the following pairs unless credit for both courses is offered: 55a, 55b; 58a, 58b; 67a, 67b; 76a, 76b.

*May not be counted for upperclass group.

The department offers the following advanced courses, 56b, 69, 88, 92, 93, 94, 95, and 96, exclusively for its Honors and graduate students, though specially qualified students from other departments will be admitted by permission of the instructor.

***51. Modern Economic Society.** Repeated in second term. Credit five hours. Daily except S, 8, 9, 10, 11, 12, 2. Assistant Professor SLICHTER.

A survey of the existing economic order, its more salient and basic characteristics, its operation, and some of the major problems—tariff, public utility, trust, labor, land, and taxation—arising under it.

In the first term the registration will be limited in number. Assignment to sections will be made on the registration days at *Goldwin Smith* 260.

54. Current Economic Problems. First term. Credit three hours. Prerequisite, course 51 or its equivalent. Acting Professor ROGERS. T Th S, 9. *Goldwin Smith* 264.

This course is a continuation of course 51 designed especially for students not majoring in Economics. A study of economic problems of current interest.

55a. Elementary Social Science. First term. Credit three hours. Professor WILLCOX. M W F, 9. *Goldwin Smith* B.

An introductory course upon social science or sociology, its field and methods.

55b. Elementary Social Science. Second term. Credit three hours. Course 51 should accompany or precede this course. Open by special permission to students who have not taken course 55a. Professor WILLCOX. M W F, 9. *Goldwin Smith* B.

A continuation of the preceding course but with special reference to the family as a primary social group, to race and immigration questions, and to the dependent, defective, and delinquent classes.

56b. Social Theory. Second term. Credit two hours. Prerequisite, course 55a or related courses in Philosophy or History and a grade of work satisfactory to the instructor. Admission on personal or written application. Professor WILLCOX. Th, 4-6, or a day and hour to be arranged at the first meeting. *Goldwin Smith* 259.

Critical reading and discussion of two or three of the leading books on Social Theory or Sociology; collateral reading and reports.

58. Accounting. Second term. Credit five hours. Prerequisite, course 51 or its equivalent. Professor ENGLISH. Daily except S, 10. *Goldwin Smith* 256. Two practice periods a week. *Goldwin Smith* 271.

The subject matter of courses 58a and 58b in a single course.

58a. Accounting. First term. Credit three hours. Prerequisite, course 51 or its equivalent. Professor ENGLISH. M W F, 8. *Goldwin Smith* C. One practice period a week. *Goldwin Smith* 271.

Theory of debit and credit; the journal and ledger; the development of books of original entry; analysis of income sheets and balance sheets.

58b. Accounting. Second term. Credit three hours. Prerequisite, course 58a. Professor ENGLISH. M W F, 8. *Goldwin Smith* 256. One practice period a week. *Goldwin Smith* 271.

The issue and transfer of capital stock; bonds and their valuation; depreciation; reserves and reserve funds; sinking funds; analysis of income sheets and balance sheets.

59. Accounting Theory and Problems. Throughout the year. Credit three hours a term. Prerequisite, course 58b or its equivalent, and, after 1923-24, Mathematics 82. Professor ENGLISH. M W F, 9. *Goldwin Smith* 256.

A critical study of the fundamental principles underlying accounting procedure. The solution of typical problems in cost accounting, in corporate consolidation, reorganization, and liquidation and in other special fields.

*May not be counted for upperclass group.

63a. Corporation Finance. First term. Credit three hours. Prerequisite, course 58a or course 64. Professor REED. T Th S, 11. *Goldwin Smith* 256.

A study of the business corporation, its economic significance and effects. An analysis of the financial operations of railroads, public utilities, and industrial corporations.

63b. Investments and Speculation. Second term. Credit three hours. Prerequisite, Money and Banking or Accounting. Acting Professor ROGERS. M W F, 9. *Goldwin Smith* 264.

A study of the general theory of investment, a discussion of the chief types of investment securities, and a description of investment banking houses and of the speculative exchanges, with special emphasis in their economic significance.

64. Money and Banking. Throughout the year. Credit six hours on completion of the course. Prerequisite, course 51. Professor REED. T Th S, 10. *Goldwin Smith* 142.

A study of the theory and history of money and banking.

64s. Money and Banking. Second term. Credit five hours. Prerequisite course 51. Acting Professor ROGERS. Daily except S, 10. *Goldwin Smith* 264.

A discussion of the more important phases of the theory of money and credit followed by a study of the American and European banking systems, foreign exchange, and currency reform.

Students may elect either course 64 or course 64s but not both.

65a. Public Regulation of Industry and Trade. First term. Credit three hours. Prerequisite, course 51. Consult the instructor before registering. Dr. COPELAND. M W F, 10. *Goldwin Smith* 256.

Theories of the relation of the public to business. Government methods and policies. Experiments in public control. Regulation of public utilities and their rates.

65b. Trusts and Modern Capitalism. Second term. Credit three hours. Prerequisite, course 58a or 64. Consult the instructor before registering. Dr. COPELAND. M W F, 10. *Goldwin Smith* 245.

A study of monopolistic combinations and trade organizations in selected industries. The work will consist of individual research and class discussion.

66. Problems in Corporation Finance. Second term. Credit three hours. Consult the instructor before registering. Professor REED. T Th S, 11. *Goldwin Smith* 256.

67a. Trade Unionism in the United States. First term. Credit three hours. Prerequisite, course 51. Assistant Professor SLICHTER. M W F, 11. *Goldwin Smith* 264.

A study of the origins, development, philosophies, aims, and policies of American trade unionism with special reference to the factors which have determined the character of the American labor movement and with emphasis on current problems of unionism and on present trends in union policies.

67b. The State in Relation to Labor. Second term. Credit three hours. Consult the instructor before registering. Assistant Professor SLICHTER. M W F, 11. *Goldwin Smith* 242.

An examination of the efforts of the State to assist in the solution of the labor problem. Conciliation, arbitration, industrial courts, the legal minimum wage, workmen's compensation, labor exchanges, social insurance, administrative machinery and problems.

69. Industrial Government. Second term. Credit three hours. Consult the instructor before registering. Assistant Professor SLICHTER. M W F, 9. *Goldwin Smith* 242.

An intensive examination of problems arising from the participation of labor in the government of industry. Evolution of trade agreements and experience under representative trade agreements will be studied in some detail and an examination will be made of some of the more important untried proposals.

73. Transportation. First term. Credit, three hours. Prerequisite, course 51. Mr. SHERRINGTON. T Th S, 9. *Goldwin Smith* 256.

A study of the economic importance of transportation by land and water; and the extent to which government regulation of rates, management, and service is necessary.

76a. Elementary Statistics. First term. Credit three hours. Open only to those who have taken course 55b or are majoring in Economics. Professor WILLCOX. M W F, 11. *Goldwin Smith* 256. Laboratory, W, 2-4. *Goldwin Smith* 259.

An introduction to census statistics with especial reference to the federal census, and to registration statistics with especial reference to those of New York State. The course gives an introduction to the methods and results of statistics in these, its best developed, branches.

76b. Economic Statistics. Second term. Credit three hours. Prerequisite, course 76a. Students majoring in Economics who have not had course 76a or its equivalent may be admitted by special permission. Professor WILLCOX. M W F, 11. *Goldwin Smith* 256. Laboratory, W, 2-4. *Goldwin Smith* 259.

A continuation of course 76a, dealing mainly with the agricultural, industrial, and commercial statistics of the United States. The course is an introduction to statistics in its application to more difficult fields, such as production, wages, prices, and index numbers.

84. Introduction to Economic Theory. First term. Credit three hours. Consult the instructor before registering. Acting Professor ROGERS. T Th S, 10. *Goldwin Smith* 264.

A study of modern economic theory with special emphasis on quantitative considerations.

[86. Principles of Economics. First term. Credit five hours. Professor DAVENPORT.] Not given in 1923-24.

[87. Public Revenues. Second term. Credit five hours. Primarily for advanced students. Professor DAVENPORT.] Not given in 1923-24.

[88. Value and Distribution. Throughout the year. Credit six hours on completion of the course. Primarily for graduates. Professor DAVENPORT.] Not given in 1923-24.

91. Demography of the United States. First term. Credit two hours. Prerequisite, course 76a or its equivalent. Professor WILLCOX. Th, 4-6. *Goldwin Smith* 259.

An advanced course studying American statistics of birth, death, marriage, divorce, immigration, crime, etc.

92. Research in Finance. Throughout the year. Credit two hours. Consult the instructor before registering. Acting Professor ROGERS. Hours to be arranged.

The topic for the first term will be Financial Theory and Currency Problems; the topic for the second term will be Business Cycles

93. Research in Accounting. Throughout the year. Credit one hour a term. Consult the instructor before registering. Professor ENGLISH. Hours to be arranged.

94. Research in Industrial Relations. Throughout the year. Credit two hours a term. Consult the instructor before registering. Assistant Professor SLICHTER. Hours to be arranged.

Discussions and individual investigations of current and theoretical problems in the field of industrial relations.

95. Economic Institutions. Second term. Credit two hours. Consult the instructor before registering. Dr. COPELAND. Hours to be arranged.

Psychological and biological foundations of current economic structure and process; social inheritance of economic traits; primitive economic communities and the evolution of modern capitalism.

96. **Current Financial Analysis.** Throughout the year. Credit two hours a term. Consult the instructor before registering. Professor REED. Hours to be arranged.

Critical discussions of current financial publications.

Agricultural Economics. (See Agricultural Economics and Farm Management in the *Announcement of the College of Agriculture.*)

Attention is called to the following courses given in the College of Law: Contracts, Restraints on Business and Industry, Taxation.

EDUCATION

Psychology 1, 1a, or 1b, is prerequisite to all courses in Education.

1. **Educational Psychology.** Repeated in second term. Credit three hours. Lectures and recitations. First term, M W F, 11. *Goldwin Smith 242.* Assistant Professor WAKEMAN and Mr. GILBERT. Second term, M W F, 10. *Goldwin Smith 142.* Professor OGDEN and Mr. GILBERT.

A study of functional psychology with special reference to the learning process and its application to educational theory and practice.

2. **Principles of Education.** First term. Credit three hours. Prerequisite, course 1. Professor OGDEN. M W F, 2. *Goldwin Smith 234.*

The nature and significance of education; biological and psychological foundations; the school as a social institution; educational ideas and values; the curriculum; administration and general methods.

3. **History of Education.** Second term. Assistant Professor WAKEMAN and Mr. GILBERT. Credit three hours. Prerequisite, course 1. Section A, T Th S, 10; Section B, T Th S, 12. *Goldwin Smith 234.*

A general historical account of the development of educational aims, contents, and methods in relation to ethnological, psychological, and sociological factors.

Students who elect course 3 must apply at *Goldwin Smith 248* for assignment to sections.

4. **High School Teaching and Method.** First term. Credit three hours. For seniors only. Professor JORDAN. M W F, 3. *Goldwin Smith 242.*

Aims to train students who expect to teach in secondary schools; relation and duties of high school teachers to their students, the community, and the state; methods of class management and types of recitation. Observation of actual high school classes required.

4a. **Observation and Practice in High School Method.** First term. Credit one hour. For seniors only. Professor JORDAN. M, 4. *Goldwin Smith 242.*

Planned to be taken coincidentally with course 4, and required of students desiring to meet the New York State requirements for the provisional professional certificate.

5. **Philosophy of Education.** Second term. Credit three hours. Prerequisite, course 1 and at least one course in philosophy. Professor OGDEN. T Th S, 11. *Goldwin Smith 248.*

A study of education as interpreted by the more important philosophical conceptions and theories, with special application to the spirit and demands of modern society.

6. **Experimental Education.** Second term. Credit two hours. Prerequisite, course 1 and Psychology 3. Assistant Professor WAKEMAN. Hours to be arranged. *Goldwin Smith 248.*

The chief problems of experimental education; the application of psychological and statistical methods to problems of educational measurement; chief results and practical bearings.

7. Mental Measurements. First term. Credit three hours. Prerequisite, course 1 and Psychology 3. Assistant Professor WAKEMAN and Mr. GILBERT. Lectures T Th, 9. *Goldwin Smith* 236. Laboratory, Section A, T, 2-4:30; Section B, Th, 2-4:30. *Goldwin Smith* 248.

The single tests and test systems; logical and mathematical treatment of experimental data; the bearing of tests upon problems of psychological theory (nature and distribution of intelligence, the correlation of abilities, etc.). The laboratory work is intended to give practice in administering tests, both to individuals and to groups.

8. Experimental Investigation. Repeated in second term. Credit and hours to be arranged. Prerequisite, course 6 or 7. Professor OGDEN and Assistant Professor WAKEMAN. *Goldwin Smith* 251.

Experimental study of a special problem in educational psychology or in mental measurements.

9. Reading of German Educational Psychology. First term. Credit two hours. Prerequisite, course 1. Professor OGDEN. F, 4-6. *Goldwin Smith* 248.

The aim of the course is to aid in facility of translation and to familiarize the student with certain monographic literature.

10. Educational Administration and Supervision. Throughout the year. Credit two hours a term. Prerequisite, course 1. Professor JORDAN. M W, 9. *Goldwin Smith* 248.

Principles of administration and supervision of state and city school systems, involving problems of evaluation and improving teaching and subject matter in the public schools. The course will be adapted to the particular needs of the class.

11. The Secondary School. Second term. Credit three hours. Supplementary to course 2. Professor JORDAN. M W F, 2. *Goldwin Smith* 234.

Principles underlying secondary education; the evolution, function, and possibilities of the secondary school as an agent of democracy; its organization and curriculum from the point of view of the administrator.

17. Mental Development. First term. Credit three hours. Prerequisite, course 1. Professor OGDEN. T Th S, 10. *Goldwin Smith* 248.

A course in child psychology, dealing with the facts of mental growth and their interpretation.

18. Educational Measurements. Second term. Credit two hours. Prerequisite, course 7. Assistant Professor WAKEMAN. T Th, 2. *Goldwin Smith* 248.

The theory of educational measurements; the use of statistical methods in the construction, standardization, and evaluation of educational tests; the relation between mental and educational tests.

[19. Aesthetic Education. First term. Credit two hours. Prerequisite, course 1. Professor OGDEN.] Not given in 1923-24.

20. Seminary in Education. First term. Credit two hours. Prerequisite, course 1. Professor OGDEN. M, 4-6. *Goldwin Smith* 248.

Topics relevant to the fundamental assumptions of educational theory will be chosen. Primarily for graduate students.

21. Seminary in Education. Second term. Credit two hours. Professor JORDAN. M, 4-6. *Goldwin Smith* 248.

Topics developing from historical and current problems of educational practice, especially, as related to administration and conduct of the public school system, and of the university. Primarily for graduate students.

ENGLISH

***1. Introductory Course.** Throughout the year. Credit three hours a term. Students who have not taken the course in the first term may enter in the second term in sections provided for them. Open only to underclassmen who have satisfied the entrance requirements in English. Assistant Professor SMITH, Dr. MANNING SMITH, Dr. SANDERS, Messrs. BALDWIN, LONG, HOTCHKISS, MARX, NELSON, VAN ALLEN, FRENCH, HALE, JONES, LAPE, MITCHELL, GREENE, JOHNSON, BLODGETT, and CARROLL. Sections at the following hours: M W F, and T Th S, 8, 9, 10, 11, 12, 2. Rooms to be announced.

A study of composition in connection with the reading of representative works in English literature, including four plays of Shakespeare, two modern novels, selected essays, and poems of Browning and Tennyson. Registration in the course is in charge of Professor SMITH.

Students who elect English 1 must apply at *Goldwin Smith A* on Wednesday, Thursday, Friday, or Saturday of registration week for assignment to sections.

***2. Composition and Literature.** For engineering students only. Registration in charge of the College of Engineering; departmental representative, Assistant Professor FISKE.

5. Short Story Writing. Second term. Credit three hours. Open to upperclassmen after consultation with the instructor. Intended especially for students who are looking forward to writing as a profession. Assistant Professor SMITH. T Th S, 10. *Goldwin Smith 160.*

8. English Usage and Style. Throughout the year. Credit three hours a term. Prerequisite, course 20 or its equivalent. The instructor's permission must be obtained before enrollment. Professor STRUNK. T Th S, 9. *Goldwin Smith 160.*

A study of the theory of good English, with practical applications. How usage is determined; matters of dispute in vocabulary, idiom, and pronunciation; essays and other exercises.

10. Play Writing. First term. Credit two hours. Open to seniors and graduates who show some special aptitude for the proposed work. Professor SAMPSON. T Th, 11. *Goldwin Smith 159.*

12. Advanced Composition. Throughout the year. Credit two hours a term. Writing in fields determined by the student's individual preference. Open to seniors who have completed course 5, 8, or 10, and to graduates. Professor STRUNK. Hour and room to be arranged.

***20. Nineteenth Century Prose.** Throughout the year. Credit three hours a term. Prerequisite, course 1. Professors PRESCOTT and NORTHUP, Assistant Professors MONROE, HEBEL, and FISKE, Dr. MANNING SMITH, and Messrs. BALDWIN and LONG. M W F, 9, 10, 11; T Th S, 8, 10, 11, 12. *Goldwin Smith 164*, and other rooms to be announced.

Reading of English prose with special reference to style; practice in composition, with conferences.

Students who elect English 20 must apply at *Goldwin Smith 164* on Friday or Saturday of registration week for assignment to sections.

***22. Nineteenth Century Poetry.** Throughout the year. Credit three hours a term. Prerequisite, course 1. Students who have not taken the course in the first term may enter in the second term. Open to sophomores and upperclassmen. Professor SAMPSON, Assistant Professors BROUGHTON and HEBEL, and Mr. BALDWIN. M W F, 9. *Goldwin Smith 156.* M W F, 11. *Goldwin Smith A*, T Th S, 9, 10. *Goldwin Smith 156.* M W F, 2. *Goldwin Smith 156.*

Wordsworth, Coleridge, Byron, Shelley, and Keats.

Students who elect English 22 must apply at *Goldwin Smith 159* on Friday or Saturday of registration week for assignment to sections.

*May not be counted for upperclass group.

32. **History of English Literature.** Throughout the year. Credit three hours a term. Open to graduates, and to upperclassmen who have taken two full years of English. Professor STRUNK. T Th S, 10. *Goldwin Smith* 162.

Lectures on English literature from the time of Chaucer to the present, with reading and reports.

34. **Chaucer.** Throughout the year. Credit three hours a term. Open to upperclassmen only. MWF, 9. Assistant Professor FISKE. *Goldwin Smith* 120.

First term: preliminary study of Chaucer's life and times; reading in the shorter poems. Second term: the *Canterbury Tales*.

35. **Biography.** Second term. Credit two hours. Open to upperclassmen who have had two years of English. Assistant Professor SMITH. T Th, 3. *Goldwin Smith* 164.

Boswell's Johnson, Gibbon, Franklin.

36. **The English Bible.** Throughout the year. Credit two hours a term. Open to upperclassmen only. Assistant Professor FISKE. W, 3-5. *Goldwin Smith* 162.

A study of the King James Version as an English classic.

37. **Shakespeare.** First term. Credit three hours. Open to upperclassmen only. Professor STRUNK. M W F, 10. *Goldwin Smith* 156.

A study of the principal tragedies.

38. **Eighteenth Century Poetry.** Throughout the year. Credit two hours a term. Open to upperclassmen only. No new registrations for second term without consent of instructor. First term, Assistant Professor MONROE. Second term, Professor PRESCOTT. T Th, 12. *Goldwin Smith* 156.

English poets of the Restoration and the eighteenth century; Dryden, Pope, Thomson, Gray, Collins, Goldsmith, Cowper, and Burns; the lesser English and Scotch poets; beginnings of the English romantic movement.

39. **Eighteenth Century Prose.** Throughout the year. Credit two hours a term. Open to upperclassmen only. Assistant Professor BROUGHTON. T Th, 9. *Goldwin Smith* 142.

Defoe, Swift, Addison, Steele, Johnson, Goldsmith, and Burke.

41. **The English Drama to 1642.** First term. Credit three hours. Open to upperclassmen only. Professor ADAMS. M W F, 11. *Goldwin Smith* B.

First term: the origin of the drama; miracles; moralities; interludes; the first regular comedies and tragedies; the predecessors of Shakespeare. [Second term: the contemporaries and successors of Shakespeare. Omitted in 1923-24.]

42. **English Literature of the Renaissance.** First term. Credit three hours. Open to graduates and, by permission, to seniors who have passed twelve hours in English with a grade of A or B. Professor ADAMS. M W F, 10. *Goldwin Smith* 160.

A study of English non-dramatic literature from More's *Utopia* to Spenser's *Faerie Queene*.

44. **Shakespeare.** First term. Credit three hours. Open to upperclassmen only. Professor ADAMS. M W F, 3. *Goldwin Smith* 142.

Shakespeare's dramatic technique studied in his chief plays.

45. **Modern Novelists.** First term. Credit two hours. Open only to upperclassmen who have passed twelve hours of work in English with grade of A or B. Professor SAMPSON. T Th, 3. *Goldwin Smith* 156.

A study of some of the representative works of recent novelists: Meredith, Hardy, Henry James, Conrad, and others.

[46. **Byron.** First term. Credit two hours. Open only to upperclassmen who have had course 22. Professor PRESCOTT.] Not given in 1923-24.

46a. **Shelley.** First term. Credit two hours. Open to upperclassmen who have had course 22. Professor PRESCOTT. T Th, 2. *Goldwin Smith* 162.

A study of Shelley's life, his principal works, and his influence.

47. The Theory of Poetry and Versification. Throughout the year. Credit two hours a term. Open to upperclassmen. Professor PRESCOTT. M W, 10. *Goldwin Smith* 162.

A study of the nature of poetry and poetic forms.

48a. American Literature. First term. Credit three hours. Open to seniors and graduates. Professor PRESCOTT. M W F, 12. *Goldwin Smith* 156.

American literature of the colonial and revolutionary periods; the growth of literary independence; Irving, Bryant, and Cooper.

48b. American Literature. Second term. Credit three hours. Open to seniors and graduates. Prerequisite, course 48a. Professor PRESCOTT. M W F, 12. *Goldwin Smith* 156.

American prose and poetry of the nineteenth century.

49. Pastoral Poetry. Throughout the year. Credit two hours a term. Open to upperclassmen and graduates. Assistant Professor BROUGHTON. M, 3-5. *Goldwin Smith* 162.

A study of the sources, origin, and development of the appreciation of rustic life and landscape in English poetry. Among the authors considered are Theocritus, Virgil, Spenser, Shakespeare, Fletcher, Jonson, Milton, Pope, Thomson, Collins, Burns, and Wordsworth.

50. Spenser and Milton. Throughout the year. Credit three hours a term. Open to upperclassmen. The instructor's permission must be obtained for admission to the second term. Assistant Professor HEBEL. T Th S, 11. *Goldwin Smith* 156.

A study of the poetry of Spenser and Milton.

51. Seventeenth Century Poetry. Second term. Credit two hours. Open to seniors and graduates after consultation with the instructor. Assistant Professor HEBEL. Hours to be arranged.

52. Victorian Literature. Throughout the year. Credit three hours a term. Open to upperclassmen and graduates. Professor NORTHUP. T Th S, 9. *Goldwin Smith* 124.

Lectures on the chief literary tendencies and characteristics of the period; studies of the leading poets and of some of the greater writers of prose. The work in this course is essentially different from that of courses 1 and 20.

53. Old English. Throughout the year. Credit three hours a term. Open to upperclassmen. Assistant Professor MONROE. M W F, 9. *Goldwin Smith* 162.

Old English grammar. Reading of selections from the Old English Chronicle, King Alfred, Ælfric, and other representative prose texts, and of the simpler poetry. Supplementary lectures and collateral reading on the growth of the language.

This course is recommended by the department to those intending to teach English. The course should be taken in the junior year.

55. Old English Literature. Second term. Credit two hours. Open to graduates and qualified seniors. Assistant Professor MONROE. M W, 3, or hours to be arranged. *Goldwin Smith* 164.

Reading of selected Old English works including Beowulf or some of the Cynewulfian poetry; studies in textual criticism and in style and metre; supplementary reading.

56. Middle English. Credit two hours. Open to upperclassmen and graduates. Dr. MANNING SMITH. Room and hour to be announced.

Studies in Middle English literature.

[57. The Arthurian Legends. First term. Credit two hours. Open to upperclassmen and graduates. Professor NORTHUP.] Not given in 1923-24.

58. Celtic Literature in English. First term. Credit two hours. Open to upperclassmen and graduates. Professor NORTHUP. T Th, 12. *Goldwin Smith* 124.

An introduction to the literary expression of the Celtic genius. A study of the characteristic traits of Irish, Welsh, and Scottish Gaelic literature. Lectures, readings from both ancient and modern literature, and reports. The course will be given in alternate years

59. Dramatic Structure. Throughout the year. Credit three hours. Open to seniors and graduates. First term, Professor SAMPSON; second term, Professor STRUNK. M W F, 3. *Goldwin Smith* 156.

A study of the principles of dramatic construction, based upon Greek, Elizabethan, and classical French drama (first term), and modern drama (second term). Reading of a hundred representative plays.

69. Teachers' Course. Second term. Credit two hours. Professor NORTHUP. T Th, 12. *Goldwin Smith* 124.

Lectures, readings, and conferences on the teaching of English in the secondary schools. Open to seniors and graduates who intend to teach English.

71. English Translations of Greek and Latin Classics. Throughout the year. Credit three hours a term. Open to sophomores and upperclassmen. Professor COOPER. T, 3, Th, 3-5. *Goldwin Smith* 236.

Rapid reading in the best translations, with emphasis upon Greek masterpieces; for example, the Iliad and the Odyssey, the tragedies of Sophocles, and several dialogues of Plato. Translations from the Latin will be chosen for the bearing of the original works upon modern literature.

72. Principles of Literary Criticism. Throughout the year. Credit three hours a term. Open to seniors and graduates. Professor COOPER. W, 3-5, and another hour to be arranged. *Goldwin Smith* 236.

A study of the chief theories of poetry, and chief kinds of literature, with illustrations drawn from writers both ancient and modern.

73. Dante in English. Throughout the year. Credit three hours a term. Open to seniors and graduates. Professor COOPER.

Reading for the sake of historical perspective, followed by a study of the Divine Comedy in the best translations. M, 3-5:30. *Goldwin Smith* 236.

74. English Literary Types. Throughout the year. Credit three hours a term. Open to sophomores and upperclassmen. Professor COOPER. M W F, 10. *Goldwin Smith* 164.

A study of typical selections from the earlier periods of English literature, and of parallel selections from modern writers, to throw light upon English and American ideals. Students may be admitted at the beginning of either term after consultation with the instructor.

75. Methods and Materials in the Study of English. Throughout the year. Credit two hours a term. Open to graduates. Professor COOPER.] Not given in 1923-24.

76. Chaucer Seminary. Throughout the year. For graduates only. Professor COOPER. Wednesday, 7:30 p. m. *English Seminary Room.*

A survey of books and topics that are essential to the study of Chaucer and his age; systematic reading of his works; a detailed examination of significant problems.

80. Wordsworth and his Contemporaries. Credit three hours a term. Open to seniors and graduates. Assistant Professor BROUGHTON. F, 3-5:30. *Goldwin Smith* 162.

A detailed study of the works of Wordsworth and their influence on contemporary English thought and literature.

81. The Tudor-Stuart Drama. For graduates only. Professor ADAMS. Hours to be arranged.

A detailed study of some one dramatist, or the investigation of some question relating to the period.

82. **Pastoral Poetry.** For graduates only. Assistant Professor BROUGHTON. Hours to be arranged.

Studies in the criticism and bibliography of the subject, Elizabethan pastorals, and foreign influences on the pastoral.

83. **Early Middle English.** For graduates only. Assistant Professor MONROE. Hours to be arranged.

Textual and historical study of Layamon's Brut, with special reference to its connection with the Arthurian legend.

84. **Problems and Methods in Elizabethan Research.** For graduates only. Professor ADAMS. Hours to be arranged.

A critical examination of the best recent Elizabethan scholarship, and of the more important periodicals and books of reference used in research. Each student will be assigned some problem for investigation.

86. **Nineteenth Century Fiction.** For graduates only. Throughout the year. Professor NORTHUP. Th, 4-6. Room to be announced.

A seminary course; studies in the development of the novel from Scott to Meredith.

88. **American Literature.** For graduates only. Professor PRESCOTT. Hours to be arranged.

The literary relations of England and America. Provincial and national traits in American literature.

89. **The Drama.** For graduates only. Throughout the year. Professor SAMPSON. Hours to be arranged.

A study of the technique of several of the chief Elizabethan and modern dramatists.

90. **Poetry.** For graduates only. First term. Professor SAMPSON. Th, 4. A study of the structure of lyric poetry.

91. **The Sonnets of Shakespeare.** For graduates only. Throughout the year. Professor ADAMS. Th, 3-5. Room to be announced.

ENTOMOLOGY AND LIMNOLOGY

INTRODUCTORY ENTOMOLOGY

2. **The Ecology of Insects.** First term. Credit three hours. One lecture and two practical exercises. Lecture, Th, 9. *Roberts Hall* 392. Practical exercises, one Th, 2-4:30, and one by appointment. Professor NEEDHAM and Mr. SIBLEY. Laboratory fee, \$2.50.

A general course in the study of the lives of insects in relation to their environment. Practical studies will be made of the activities of insects and of the role that they play in different natural associations. Observations will be made on the relations between their structures and instincts and the situations in which they live, and on many of the ways in which they find a living and establish homes. Laboratory fee, \$2.50.

3. **General Entomology.** First term. Credit three hours. Prerequisite, Biology 1, or Zoology 1, or Botany 1. Lectures, W F, 9. *Roberts Hall* 392. Professor HERRICK. Practical exercises, M or W or Th or F, 2-4:30 or S, 8-10:30. *Roberts Hall* 392. Professor HERRICK, Mr. PACK, and Miss GRISWOLD.

This course embraces lectures on the characteristics of orders, suborders, and the more important families, and on the habits of representative species. The practical exercises include a study of the structure of insects and practice in their classification. The lectures only (2 hours) may be taken by those who have had courses 4 and 5. Laboratory fee, \$2.50.

4. **Elementary Morphology of Insects.** Either term. Credit three hours. By appointment. *Roberts* 391. Professor JOHANNSEN and Mr. SMIT. External and internal anatomy of insects. (See note under course 5.)

5. **Elementary Systematic Entomology.** Either term. Credit two hours. By appointment. Prerequisite, course 4. *Roberts* 391. Professor BRADLEY and Mr. GOOD.

The wing venation of insects. The determination of family characters of a selected set of insects.

Courses 4 and 5 are introductory laboratory courses dealing with the structure and classification of insects, required of all students who plan to take advanced work in entomology. The work is individual, and both courses may be taken in one term. Laboratory fee, \$2.

6. **Elementary Insect Taxonomy.** First and second terms. Credit three hours each term. Prerequisite, course 5. M W F, 2-5. *Roberts Hall* 301. Professors BRADLEY, NEEDHAM, HERRICK, JOHANNSEN, Assistant Professor CLAASSEN, Dr. FORBES, and Mr. SIBLEY.

A survey of the more important species of insects commonly met with, and the characters by which they may be recognized. Laboratory fee, \$4.50 a term.

SYSTEMATIC ENTOMOLOGY

[10. **Entomotaxy.** Credit two hours. Laboratory and field work. Professor BRADLEY.] Not given in 1923-24.

11. **Advanced Systematic Entomology.** First term. Credit three or more hours. Prerequisite, course 5. Three laboratory periods of three hours each by appointment. *Roberts Hall* 301. Professor BRADLEY.

A training course in the identification and interpretation of obscure characteristics of insects. One hundred and thirty-five or more hours a term in the laboratory must be accomplished by students registered for this course. Laboratory fee, \$6.

14. **Entomological Literature and its Technics.** First term. Credit three hours. Prerequisite, course 3 or 5, or Zoology 5. Lectures and recitations. M W F, 11. *Roberts Hall* 392. Professor BRADLEY.

A study of general entomological literature. Practice in the use of generic and specific indices and of bibliographies, and in the preparation of the latter; methods of preparing technical papers for publication. The rules of nomenclature, including the formation of scientific names.

This course is technical and intended to aid students, who desire to specialize in entomology or systematic zoology, in their contact with literature.

INSECT MORPHOLOGY

20. **Morphology and Development of Insects.** Throughout the year. Credit two hours a term. Prerequisite, courses 4, and 3 or 5. Lectures, assigned reading, and reports. Professor JOHANNSEN. T Th, 10. *Roberts* 392.

21. **Histology of Insects.** Must be preceded or accompanied by course 20. Professor JOHANNSEN. *Roberts Hall* 392.

First term: Technique in histological methods as applied to insects. Laboratory W, p. m., and two periods by appointment. Credit three hours. Laboratory fee, \$4.50.

Second term: Comparative study of insect histology from prepared slides. Laboratory W, p. m., and one period by appointment. Credit two hours. Laboratory fee, \$1.50.

27. **German Entomological Reading.** First term. Without credit. Two hours weekly, to be arranged. Open to advanced students in Entomology who have an elementary knowledge of German. *Roberts Hall* 392. Professor JOHANNSEN.

28. **French Entomological Reading.** Second term. Without credit. Two hours weekly to be arranged. Open to advanced students in Entomology who have an elementary knowledge of French. *Roberts Hall 392.* Professor JOHANNSEN.

PARASITOLOGY AND MEDICAL ENTOMOLOGY

30. **Parasites and Parasitism.** First term. Credit two hours. Must be preceded or accompanied by Biology 1 or Zoology 1. Lectures, T, 9. Practical exercises, T, 2-4:30. *Roberts Hall 392.* Assistant Professor MATHESON and Mr. L. S. WEST.

A consideration of the origin and biological significance of parasitism, and of the structure, life history, and economic relations of representative parasites. Laboratory fee, \$2.

31. **The Relations of Insects to Disease.** Second term. Credit two hours. Prerequisite, course 3 and Zoology 1. Lecture T, 9. *Roberts 392.* Practical exercise, T, 2-4:30. Assistant Professor MATHESON and Mr. L. S. WEST.

Causation and transmission of disease by insects and other arthropods. Laboratory fee, \$2.

LIMNOLOGY

50. **General Limnology.** Second term. Credit three hours. Open only to students who have taken or are taking Biology 1 and Entomology 3 or equivalents. Professor NEEDHAM and Mr. SIBLEY. Lectures, Th, 9. *Roberts 392.* Laboratory, Th, 2-4:30, and one period by appointment. *Roberts 492.*

An introduction to the study of the life of inland waters. Aquatic organisms in their qualitative, quantitative, seasonal, and ecological relations. Laboratory fee, \$2.50.

RESEARCH

100. **Research.** Throughout the year. Credit three or more hours a term. Prerequisite, permission to register from the professor under whom the work is to be taken. *Roberts Hall.* Professors NEEDHAM, HERRICK, CROSBY, JOHANNSEN, BRADLEY, and EMBODY, and Assistant Professors MATHESON, ALLEN, and CLAASSEN.

Seminary. Throughout the year. M, 4:30-5:30. *Roberts 392.*

The work of an entomological seminary is conducted by the *Jugatae*, an entomological club which meets for the discussion of the results of investigations by members.

GEOLOGY

GENERAL GEOLOGY

*1. **Elementary Geology.** Repeated in second term. Credit three hours. Professor RIES, and Messrs. BELL and BOWEN, Miss ST. JOHN and Miss BROTHERHOOD. Lectures, first term, T Th, 11, *Sibley Dome*; second term, T Th, 9, *Sibley Dome*. Laboratory period, M T W Th F afternoon or S morning. Students must register for laboratory assignments at *Elementary Geology Laboratory, McGraw Hall*, before the beginning of the course.

Planned to give beginners the fundamental principles of this branch of science. Those desiring additional work in geology are advised especially to take one or more of the following courses: 1a, 2, 2a, 11, 21, 32. For description of these see below.

DYNAMIC AND STRUCTURAL GEOLOGY

1a. **Dynamic and Structural Geology.** First term. May be taken for three or four credits. If taken for four credits there will be two laboratory periods a

*May not be counted for upperclass group.

week. Prerequisite, course 1 or equivalent. Assistant Professor RETTGER. Lectures, T Th, 11. *McGraw*. Laboratory, W, 2. Other laboratory to be arranged.

This course comprises study of certain structural and dynamic phenomena and the main facts underlying the greater problems of geology.

1b. Metamorphic Geology. Second term. Credit three hours. Assistant Professor RETTGER. Lectures, T Th, 9. *McGraw*. Prerequisite, course 1 or equivalent. Laboratory hour to be arranged.

A course intended to give the main principles of rock metamorphism, including regional, dynamic, hydrothermal, and contact metamorphism.

1c. Sedimentation. First term. Credit three hours. Prerequisite, course 1. Assistant Professor RETTGER. Lectures T Th, 9. *McGraw*. Laboratory hour to be arranged.

A course planned to give an understanding of sedimentary rock deposition, both mechanical and chemical.

1d. Geologic Model Making. Second term. Credit one or two hours. Assistant Professor RETTGER. Prerequisite, course 1. Time to be arranged. *McGraw*. The construction of geologic models. Intended chiefly for students who are majoring in Geology.

PHYSICAL GEOGRAPHY

***2. Elementary Physical Geography.** Throughout the year. Credit three hours a term; if taken after course 2a, credit two hours a term. Professor VON ENGELN and Mr. STUCKEY. Lectures, M W, 9. *McGraw, Geological Lecture Room*. Laboratory, W or Th, 2-4:30. Students must register for laboratory assignments at the Physical Geography Laboratory before the beginning of the course.

High school courses are not the equivalent of this course and will not be so considered as a prerequisite for advanced courses. All students are required to go on one all-day excursion to Enfield Gorge and Falls and Connecticut Hill.

***2a. Physiography of the Lands and Oceanography.** Second term. Credit three hours. Open only to freshman and sophomore students who have had course 1. Professor VON ENGELN and Mr. STUCKEY. Lectures, M W F, 11. *McGraw, Geological Lecture Room*.

The course comprises discussion of the systematic and cyclic development of land forms under humid, arid, and glacial conditions and the interpretation of such forms; together with consideration of oceanic phenomena and processes. Intended for students who desire to gain a scientific appreciation of the inorganic elements of the landscape.

3. Geography of North America. First term. Credit two hours. Registration only by permission of instructor. Limited to students who have made good records in course 2. Professor VON ENGELN. Lectures, T Th, 10. *McGraw, Geological Lecture Room*.

A course describing the physiographic features of North America with discussion of their influence upon the settlement and development of the various sections. In 1923-24 attention will be given especially to the West, Mexico, and the West Indies. Illustrated lectures.

5. Glaciers and Glaciation. Second term. Credit three hours. Prerequisite, course 2 or, with permission, course 1. Professor VON ENGELN and Mr. STUCKEY. Lectures, T Th, 11. *McGraw*. Laboratory, T, 2-4:30. *McGraw*.

A study of living glaciers and the phenomena of the glacial period. Field excursions during the laboratory period in the spring; longer excursions on Saturday. Mapping and interpretation of glacial deposits.

*May not be counted for upperclass group.

6. Commercial Geography. First term. Credit two hours. Prerequisite, course 2 or Economics 51. Professor VON ENGELN. Lectures, T Th, 11. *McGraw, Geological Lecture Room.* Lectures, reading, and term report.

A consideration of the geographic factors affecting production and distribution of commodities, with special reference to the rational development of natural resources, particularly of North America. Discussion of the geographic origins and nature of commercial exchange of goods, routes of commerce, localization of industry, modern city sites, utilization of tropical lands, etc.

8. Advanced Physiography, Experimental and Research Work. Throughout the year. Credit, variable. Registration only by permission. Professor VON ENGELN. Hours to be arranged. *McGraw.*

Original investigation is undertaken by each student. Reading, conferences, excursions, and presentation of reports of progress to correlate with work. In general, graduate students registering for a minor in physical geography will be expected to take up some problem in this course.

9. Seminary. First term. Credit two hours. For upperclassmen and graduate students with requisite preparation. Registration only by permission. Professor VON ENGELN. Hours to be arranged. *McGraw, Physical Geography Laboratory.*

Preparation and reading of reports upon special topics. Abstracts and discussions of current geographic literature.

Meteorology and Climatology. (See *Announcement of the College of Agriculture.*)

MINERALOGY AND PETROGRAPHY

***11. Elementary Mineralogy.** Repeated in second term. Credit three hours; if taken after course 12, credit two hours. Prerequisite, Chemistry 101. Professor GILL and Messrs. VIEWEG and MARTENS. Lectures, M W 8. *McGraw, Geological Lecture Room.* Laboratory sections to be arranged.

For beginners who desire a general knowledge of the commonest minerals and their uses, the properties by which they are recognized, and their significance as constituents of the earth's crust, or as sources of useful substances.

12. Crystallography. First term. Credit three hours; if taken after course 11, credit two hours. Prerequisite, Chemistry 205 or 210, and Physics 3. Professor GILL and Mr. VIEWEG. Lectures, T Th, 8. *McGraw, Geological Lecture Room.* Laboratory hours to be arranged.

13. Mineralogy. Second term. Credit three hours; if taken after course 11, credit two hours. Prerequisite, course 12. Professor GILL. Lectures, T Th, 8. *McGraw, Geological Lecture Room.* Laboratory hours to be arranged.

For students wishing to become acquainted with the commoner minerals and with the scientific and practical problems which they present.

14. Blowpipe Determination of Minerals. First term. Credit one hour. Prerequisite, course 11 or 13 and Chemistry 205 or 210. Professor GILL. One laboratory period Saturday morning. *McGraw, Mineralogical Laboratory.*

15. General Lithology. Second term. Credit one hour. Prerequisite, courses 1 and 11. Professor GILL. Lectures, recitations, and laboratory practice, S, 8-10. *McGraw, Mineralogical Laboratory.*

An elementary course designed to teach recognition of the various kinds of rocks, their mineral composition, mode of origin, etc.

16. Crystal Measurement and Drawing. Second term. Credit two hours. Prerequisite, course 12. Professor GILL. Hours to be arranged. *McGraw, Mineralogical Laboratory.* Laboratory measurement of crystals, with computation and drawing. Course 16 should be taken after course 12 by students who intend to continue in course 17 or in course 20.

*May not be counted for upperclass group.

17. **Optical Determination of Minerals.** First term. Credit three hours. Prerequisite, course 13. Professor GILL. M W, and laboratory to be arranged. *McGraw, Mineralogical Laboratory.*

18. **Petrography.** Second term. Credit three hours. Prerequisite, course 17. Professor GILL. M W, and laboratory to be arranged. *McGraw, Mineralogical Laboratory.*

19. **Seminary in Mineralogy and Crystallography.** Throughout the year. Credit one hour a term. Prerequisite, courses 12, 13, 17. Professor GILL. Hour to be arranged. *McGraw.*

20. **Advanced or Special Work in Mineralogy and Petrography.** Throughout the year. Prerequisite courses dependent on nature of work. Professor GILL. Hours to be arranged. *McGraw.* Adapted to the needs of the individual student.

PALEONTOLOGY AND STRATIGRAPHIC GEOLOGY

*21. **Historic Geology.** Second term. Credit three hours. Prerequisite, course 1 or its equivalent; a course in invertebrate zoology is also desirable. Professor HARRIS. Lectures, T Th, 10. *McGraw 28.* Laboratory hours to be arranged.

An elementary review of the geologic history of the earth and its inhabitants with special emphasis on the American continent; the second half of the ordinary course in Elementary Geology. Field excursions take the place of laboratory work when weather permits.

22. **General Stratigraphic Geology.** Throughout the year. Credit two hours a term. Prerequisite, courses 1 and 21. Professor HARRIS. Two periods a week, M W 10, for lectures; laboratory or field work, hours to be arranged. *McGraw 28.*

First term: Paleozoic of the world; second term: Mesozoic and Cenozoic of the world.

23. **Geological Surveying.** First term. Credit two hours. Prerequisite, courses 1 and 21 or equivalents, and spherical trigonometry. Professor HARRIS. Hours to be arranged. *McGraw 28.*

24. **Invertebrate Paleontology.** Credit two hours each term. Prerequisite, a three-hour course in biology. Professor HARRIS. M W, 9 (or other hours if more convenient). *McGraw 28.*

25. **Special Geologic Problems and Research.** Prerequisites will depend largely on the nature of the problems attacked. Outside of the consideration of a few local Paleozoic questions the energy of this branch of the department will be largely concentrated for the next three years on systematic conchology with greatest emphasis on American Tertiary Gastropoda and Pelecypoda. Professor HARRIS. *McGraw 28.*

ECONOMIC GEOLOGY

30. **Petroleum Geology.** Second term. Credit three hours. Prerequisite, courses 1 and 1a. Lectures, T Th, 11. Laboratory, W, 2. *McGraw.* Assistant Professor REITGER. A course on the geology, geologic field methods, distribution, and methods of obtaining petroleum.

*31. **Engineering Geology.** Repeated in second term. Credit three hours. Professor RIES and Mr. NEVIN. Lectures, M W, 11. Two laboratory periods, M and W or T and F. *McGraw.*

Discussion of the practical application of geologic principles to engineering work and the occurrence of such economic materials as are of importance to engineering students.

Required of Civil Engineering students. Open to Arts students only by special permission.

*May not be counted for upperclass group.

32. General Economic Geology. Throughout the year. Credit three hours a term. First term, prerequisite, course 1 or equivalent; second term, prerequisite, courses 1 and 11, or their equivalent. Professor RIES and Mr. NEVIN. Lectures, M W, 10; laboratory, Th, 2. *McGraw*.

The origin, nature, distribution, uses, and economics of the non-metallic and metallic products of the earth's crust. First term, the non-metallics, including coal, oil, gas, clays, salt, fertilizers, etc.; second term, the metallic products, including the ores of iron, copper, lead, zinc, gold, silver, etc.

35. Clay Investigation. Credit variable. Prerequisite, courses 1 or 31 and Chemistry 101 or its equivalent. Can be taken either one or two terms. Professor RIES. Hours to be arranged. *McGraw*. Lectures and laboratory work.

36. Advanced or Special Work in Economic Geology. Throughout the year. Credit three hours a term. Prerequisite courses dependent on the nature of the work. Professor RIES. Hours to be arranged. *McGraw*.

37. Seminary in Economic Geology. Throughout the year. Credit two hours a term. Prerequisite, courses 1, 11 or 13, and 32. Professor RIES. Hours to be arranged. *McGraw*.

GERMAN

***1. Course for Beginners: Oral Training, Grammar, Composition, Translation.** Repeated in second term. Credit six hours.

First term:

Sec. 1, daily, 8. *Goldwin Smith* 183. Mr. OWEN.

Sec. 2, daily, 10. *Goldwin Smith* 183. Professor POPE.

Second term:

Sec. 1, daily, 8. *Goldwin Smith* 183. Mr. OWEN.

Sec. 2, daily, 9. *Goldwin Smith* 183. Assistant Professor ANDREWS.

This course is equivalent to first year and second year German of the entrance requirements (credit two units). It may be elected for three hours' credit by students who have entrance credit for only one unit of German (first year German).

***1a. Course for Beginners: Oral Training, Grammar, Composition, Translation.** Throughout the year. Credit three hours a term.

Sec. 1, M W F, 11. *Goldwin Smith* 183. Professor BOESCHE.

Sec. 2, M W F, 12. *Goldwin Smith* 190. First term, Assistant Professor ANDREWS; second term, Mr. OWEN.

This course is equivalent to first year and second year German of the entrance requirements (credit two units). It may be elected in the second term by students who have had first year German (one unit).

***3. Oral Training, Grammar, Composition, Translation.** Repeated in second term. Credit five hours. Prerequisite, course 1 or entrance credit for two units of German (first year German and second year German).

First term:

Sec. 1, M T W Th F, 9. *Goldwin Smith* 183. Assistant Professor ANDREWS.

Sec. 2, M T W Th F, 10. *Goldwin Smith* 190. Professor FAUST.

Second term:

Sec. 1, M T W Th F, 10. *Goldwin Smith* 190. Professor FAUST.

Sec. 2, M T W Th F, 11. *Goldwin Smith* 177. Assistant Professor ANDREWS.

This course is equivalent to third year German of the entrance requirements.

***3a. Oral Training, Grammar, Composition, Translation.** Throughout the year. Credit three hours a term. Mr. OWEN. T Th S, 12. *Goldwin Smith* 183.

This course is equivalent to third year German of the entrance requirements.

***4. Elementary German Composition and Conversation.** Throughout the year. Credit three hours a term. Open to those who are taking or have taken course 3. M W F, 12. *Goldwin Smith* 183. Professor POPE.

*May not be counted for upperclass group.

Exercises conducted in German. Course 4 may be combined with course 3 or 5.

*5. **Intermediate German Course.** Throughout the year. Credit three hours a term. Prerequisite, course 3, or its equivalent.

Sec. 1, T Th S, 10. *Goldwin Smith* 177. Mr. OWEN.

Sec. 2, M W F, 11. *Goldwin Smith* 190. First term, Professor FAUST; second term, Professor POPE.

German grammar treated topically; translation and oral exercises in German on the text; reading from modern German prose. Course 4 may be combined with course 5.

*8. **Scientific German.** Second term. Credit three hours. Prerequisite, courses 1-3 or three years of German in High School. M W F, 10. *Goldwin Smith* 183. Assistant Professor ANDREWS.

[9. **Nineteenth Century Drama.** Kleist, Grillparzer, Hebbel, Hauptmann. Throughout the year. Credit three hours a term. Prerequisite, courses 1-5, or the equivalent. Professor POPE.] Not given in 1923-24.

10. **Advanced German Composition and Conversation.** Throughout the year. Credit three hours a term. Prerequisite, courses 1-5, or the equivalent. Professor BOESCHE. M W F, 10. *Goldwin Smith* 177.

Exercises conducted in German. Theme-writing. This course is essential for the pursuit of advanced work in the department, and must be completed by students who desire to be recommended as teachers of German.

11. **Lessing's Life and Works.** First term. Credit three hours. Prerequisite, courses 1-5. Professor POPE. T Th S, 11. *Goldwin Smith* 190.

12a. **Schiller's Dramas.** First term. Prerequisite, courses 1-5, or the equivalent. Assistant Professor ANDREWS. M W F, 2. *Goldwin Smith* 177.

12b. **Schiller's Lyrics and Prose.** Second term. Prerequisite, courses 1-5, or the equivalent. Professor BOESCHE. T Th S, 10. *Goldwin Smith* 183.

13. **Goethe's Life and Works.** First term. Credit three hours. Primarily for juniors and seniors. Prerequisite, courses 1-5, or the equivalent. Professor BOESCHE. T Th S, 9. *Goldwin Smith* 190.

14. **Goethe's Faust**, part I and selected portions of part II. Second term. Credit three hours. Primarily for juniors and seniors. Prerequisite, courses 1-5, or the equivalent. Professor FAUST. T Th S, 9. *Goldwin Smith* 190.

[15. **History of German Literature.** Throughout the year. Credit three hours a term. Prerequisite, courses 1-5, or the equivalent. Professor FAUST.] Not given in 1923-24.

An outline lecture course beginning in the first term, with the Old High German period and extending to the middle of the eighteenth century; in the second term beginning with Lessing and extending to the present time. Lectures, recitations, and collateral reading.

16. **Contemporary German Literature.** Throughout the year. Credit three hours a term. Prerequisite, courses 1-5, or the equivalent. Professor FAUST. M W F, 9. *Goldwin Smith* 190.

A study of the literature of modern Germany, including foreign influences. Lectures in German, recitations, and collateral reading.

37. **Middle High German.** Throughout the year. Credit three hours a term. Prerequisite, courses 1-5, 10, and at least six hours of advanced work in German literature. First term, Assistant Professor ANDREWS. *Goldwin Smith* 178. Second term, Professor POPE. M W F, 3. *Goldwin Smith* 182.

39. **Teachers' Course in German Composition.** Throughout the year. Credit two hours a term. Admission by permission only. Professor BOESCHE. T Th, 12. *Goldwin Smith* 177.

*May not be counted for upperclass group.

40. **Teachers' Course in Methods.** Second term. Credit two hours. Prerequisite, courses 1-5, 10, and twelve hours of advanced work in German literature or philology. Professor FAUST. T, 2-4. *Goldwin Smith* 181.

[42. **Gothic.** First term. Credit three hours. Professor BOESCHE.] Not given in 1923-24.

43. **Old High German.** First term. Credit three hours. Prerequisite, course 37. Professor BOESCHE. M W F, 8. *Goldwin Smith* 190. Primarily for graduates.

49. **Seminary in German Literature.** First term. Professor FAUST. Th, 2-4. *Goldwin Smith* 181. For graduates only.

50. **Seminary in German Literature.** Second term. Credit two hours. Professor POPE. Th, 2-4. *Goldwin Smith* 177. Primarily for graduates.

52. **Seminary in German Philology.** Topics in German Syntax. Second term. Credit two hours. Professor BOESCHE. W, 2-4. *Goldwin Smith* 188. Primarily for graduates.

GOVERNMENT AND PUBLIC LAW

*1. **Political Institutions.** First term. Credit three hours. Assistant Professor SABY. Lectures, M W, 10. *Goldwin Smith* B. Quiz hours to be arranged.

An introduction to the study of politics, with special reference to American government. Lectures, readings, reports, quizzes. Students desiring to specialize in politics should take this course in their sophomore year.

*2. **Comparative Politics.** Second term. Credit three hours. Lectures, M W, 10. *Goldwin Smith* B. Quiz hours to be arranged. Assistant Professor SABY.

A study of the political institutions of the leading European countries with special reference to constitutionalism and the representative system, imperialism and nationalism, and the changes wrought by the Great War. Lectures, readings, reports, quizzes.

3. **Municipal Administration.** First term. Credit three hours. Open to upperclassmen. Assistant Professor SABY. T Th S, 9. *Goldwin Smith* 177.

A study of the development of municipal government, special attention being paid to American conditions. Lectures, readings, and reports.

4. **Municipal Problems.** Second term. Credit three hours. Open to upperclassmen. Assistant Professor SABY. T Th S, 9. *Goldwin Smith* 264.

A study of special problems in municipal functions: city planning, the street railway, water and gas supply, health, police, charity and correction, education, recreation, etc. Lectures, readings, and reports.

*5. **American State Government.** First term. Credit three hours. Open to sophomores. Professor CUSHMAN. M W F, 9. *Goldwin Smith* 142.

A comparative study of American state governments. State constitutions, their origin, nature, and methods of amendment; the organization and functions of the three departments; current political and administrative problems.

*6. **Political Parties and Popular Government.** Second term. Credit three hours. Open to sophomores. Professor CUSHMAN. M W F, 9. *Goldwin Smith* 142.

The nature, organization and methods of parties; legal control of parties and elections; public opinion as a factor in popular government; initiative, referendum, and recall.

8. **History of Political Thought.** First term. Credit three hours. Assistant Professor SABY. M W F, 9. *Goldwin Smith* 236. For advanced students in Political Science.

*May not be counted for upperclass group.

A study of the development of political thought from the Greeks to modern times in its relation to the history and development of political institutions. Lectures, textbook, and assigned readings.

9. **Modern Political Thought.** Second term. Credit three hours. Assistant Professor SABY. M W F, 9. *Goldwin Smith* 236. For advanced students in Political Science.

A general survey of the more important modern political movements. Ideas and ideals underlying the present political unrest. The various political ideas that have at different times striven for supremacy in American political life. Lectures, textbook, and assigned reading.

[10. **The Nature of the State.** Second term. Credit two hours. Assistant Professor SABY. For advanced students in Political Science.] Not given in 1923-24.

20. **Constitutional Law: The American Federal System.** First term. Credit three hours. Open to upperclassmen. Professor CUSHMAN. Hours to be arranged.

Judicial interpretation of the constitution; the nature of judicial review; separation of governmental powers; relation of state national governments; construction of national powers.

21. **Constitutional Law: Fundamental Rights and Immunities.** Second term. Credit three hours. Open to upperclassmen. Professor CUSHMAN. Hours to be arranged.

Privileges and immunities of citizenship; protection of civil and political rights; the obligation of contracts; due process of law and the equal protection of the law.

[22. **Seminary in Social and Economic Problems and the Constitution.** Throughout the year. Credit two hours a term. Open to seniors and graduate students.] Not given in 1923-24.

25. **Seminary in State Government and Politics.** Throughout the year. Credit two hours a term. Open to seniors and graduate students. Professor CUSHMAN. Hours to be arranged. *Political Science Seminary.*

32. **Seminary in Political Science.** Throughout the year. Credit two hours a term. W, 2:30. Assistant Professor SABY. *Political Science Seminary.*

An advanced course for the study of some special topic to be announced. Open to especially qualified students by permission of the professor in charge.

GREEK

*1. **Elementary Greek.** Throughout the year. Credit six hours a term. This course however is continuous throughout the year, and no credit will be allowed for the first term alone. Mr. HOLTZCLAW. Daily, 8. *Goldwin Smith* 134.

The essentials of the grammar; simpler exercises in composition; selections from Xenophon's *Anabasis*, books I-VII; selections from the New Testament in Greek.

Designed for students who wish to acquire, by extraordinary effort in one year, the ability to read Attic prose.

2. **Plato, Selections; Homer's Odyssey.** Greek Composition. Throughout the year. Credit three hours a term. Mr. HOLTZCLAW. T Th S, 10. *Goldwin Smith* 236.

A continuation of the work begun in course 1, which, or at least two years of high school Greek, is prerequisite.

3. **Euripides, Sophocles.** Reading of the *Alcestis* and *Oedipus the King*, with an introduction to the Greek drama. First term. Credit three hours. Professor JONES. M W F, 10. *Goldwin Smith* 236.

*May not be counted for upperclass group.

4. **Greek Composition.** Throughout the year. Credit one hour a term. Prerequisite, course 2 or the equivalent. Mr HOLTZCLAW. Hour to be arranged. *Goldwin Smith 236.*

5. **New Testament Greek.** Throughout the year. Credit two hours a term. Prerequisite, course 1 or its equivalent. Dr. WHITE. W F, 8. *Barnes Hall Library.*

First term, Gospel according to Matthew. Introduction to the grammar and vocabulary of Biblical Greek; second term, Epistle of James and Epistle to the Hebrews.

6. **Herodotus.** Selections chosen to include the account of the conflicts between East and West. First term. Credit three hours. Professor JONES. T Th S, 11. *Goldwin Smith 236.*

*7. **Myths of the Epic Cycle.** Second term. Credit two hours. Professor JONES and Mr. HOLTZCLAW. T Th, 12. *Goldwin Smith 134.* Open only (1) to upperclassmen who have studied, or are studying, Freshman Latin or Greek and (2) to graduate students.

9. **Dramatic Poetry.** Selected plays of Aeschylus and Sophocles, beginning with the Prometheus Bound. Second term. Credit three hours. Professor JONES. M W F, 10. *Goldwin Smith 236.*

10. **Lyric Poetry.** Second term. Credit three hours. Professor JONES. T Th S, 11. *Goldwin Smith 236.*

Selections from Hiller-Crusius' Anthologia Lyrica to illustrate the various types of personal poetry.

[11. **Lucian and Aristophanes.** Throughout the year. Credit three hours a term. Professor JONES.] Not given in 1923-24.

12. **The Republic of Plato.** Throughout the year. Credit three hours a term. Professor HAMMOND. Reading of the Greek Text. Intended for students of Greek literature and of Greek philosophy. Hours to be arranged.

14. **Demosthenes, On the Crown.** Second term. Credit three hours. Professor JONES. Hours to be arranged. *Goldwin Smith 125.*

[15. **Thucydides.** First term. Credit three hours. Professor JONES.] Not given in 1923-24.

18. **Homer's Iliad (or Odyssey);** entire work to be read. Throughout the year. Credit three hours a term. Mr. HOLTZCLAW. Hours to be arranged. Open to graduates, and, by special permission, to undergraduates.

19. **Pindar.** First term. Credit three hours. Professor JONES. Hours to be arranged. *Goldwin Smith 125.*

20. **Greek Seminary.** Throughout the year. Credit three hours a term. Professor JONES. W, 2, and one other hour to be arranged. *Library, Greek and Latin Seminary Room.*

Homer, Oratory, or Geography. For graduates, and, by special permission, qualified seniors.

GREEK ART AND ANTIQUITIES

Courses 1, 3, 4a, and 4b in this department do not require any knowledge of Greek or of Latin. Courses 5, 6, and 7 presuppose facility in reading Greek. Course 7 is primarily for those expecting to study in Athens. No courses in this department are open to freshman.

A. **Greek Art.** November to March inclusive. Professor ANDREWS. Th, 4. *Goldwin Smith Museum of Casts.*

*May not be counted for upperclass group.

An introductory course of popular illustrated lectures on Greek sculpture, Greek antiquities, and Greek topography. Planned and timed especially to meet the needs of students in the technical and professional colleges, but open to all students and to the public. No university credit.

1. **History of Greek Sculpture.** Repeated in second term. Credit three hours. Professor ANDREWS. First term, M W F, 9; second term, M W F, 11. *Goldwin Smith Museum of Casts.*

Lectures in the Museum of Casts. Intended to be supplemented by course 3, but may be taken separately.

3. **Greek Antiquities.** Repeated in second term. Credit three hours. Professor ANDREWS. First term, M W F, 11; second term, M W F, 9. *Goldwin Smith Museum of Casts.*

Lectures on pre-Greek art and civilization and on Greek terra cottas, bronzes, gems, and coins. Illustrated by the material in the Museum of Casts and by stereopticon views. Intended to be taken with course 1, but may be taken separately.

4a. **Greek Pottery.** First term. Credit two hours. Professor ANDREWS. T Th, 11. *Goldwin Smith Museum of Casts.*

4b. **Greek Architecture.** Second term. Credit two hours. Professor ANDREWS. T Th, 11. *Goldwin Smith Museum of Casts.*

5. **Pausanias.** Throughout the year. Credit two hours a term. Professor ANDREWS. Hours to be arranged after consultation. *Goldwin Smith 35.*

A reading course in the sources of knowledge of Greek topography with special reference to Athens, supplemented by illustrated lectures and by reading from Thucydides and Herodotus.

6. **Greek Epigraphy.** Credit two hours. Professor ANDREWS. Hours to be arranged after consultation. *Goldwin Smith 35.*

A study of Greek alphabets and inscriptions, chiefly from the large collection of squeezes owned by the department. For graduates and qualified undergraduates.

7. **Modern Greek.** Credit two hours. Professor ANDREWS. Hours to be arranged after consultation. *Goldwin Smith 35.*

The literary language and the colloquial idiom. Athenian newspapers and stories in the vernacular will be read.

HISTOLOGY AND EMBRYOLOGY

1. **The Tissues: Histology and Histogenesis.** First term. Credit four hours. No prerequisite, but previous work in biology (zoology and botany) or physiology is recommended. Mr. HUMPHREY and assistants. Lectures, T Th, 11. *Stimson.* Laboratory, T Th, 2-4:30. *Stimson.*

For students of biology or those preparing for medicine. The cell and cellular origin of the body and the structure and development of its component tissues. Each student will prepare or receive a series of typical microscopic preparations.

2. **The Organs: Histology and Development.** Second term. Credit four hours. Prerequisite, course 1 or the equivalent. Mr. HUMPHREY and assistants. A continuation of course 1. Courses 1 and 2 together give the fundamental facts of the microscopic structure and development of the body.

3. **Special Histology and Technique.** First term. Credit two hours. Prerequisite, courses 1 and 2, or 1 and 4, or the equivalent. Mr. HUMPHREY. Two periods, M, p. m., W, p. m. *Stimson.*

In this course a more detailed knowledge of histology and greater facility in technique are gained by practical work in one or more of the fields of histology. Designed for those who desire a good working knowledge of histological methods for use in biology and in medicine and who have shown aptitude and ability.

4. **Embryology of Vertebrates.** Second term. Credit four hours. Prerequisite, course 1 or the equivalent. Lectures or recitations, Mr. ADELMANN and assistants. W F, 10. *Stimson Hall*. Laboratory, W, p. m., F, p. m. *Stimson*.

For students of biology or zoology, or those preparing for medicine. Particular emphasis is placed on the embryology of the amphibian, chick, and pig, the course giving the basis for understanding the development of the human body.

7. **Advanced Histology and Embryology.** Throughout the year. Credit three or more hours a term. Prerequisite, courses 1, 2, 3, or their equivalent. Laboratory work with conferences at hours to be arranged. Professor KINGSBURY and instructors.

Designed for those who are preparing theses or for those who wish to undertake special investigations in histology and embryology.

8. **Seminary.** Throughout the year. Credit one hour. Prerequisite, course 1 and 2, or 4; may be taken with course 3 or 7. Hours to be arranged. *Stimson*.

For discussion of current literature and presentation of original work by members of the department staff and by those doing advanced work in the department.

15. **Sex and Sex Determination.** Second term. Credit two hours. Mr. HUMPHREY. Lecture, F, 10. Laboratory, S, 10-12:30. *Stimson*.

An advanced course for graduate students and qualified upperclassmen. A study of the structure and development of the reproductive system, and the problems of sex determination and differentiation.

HISTORY

*1. **Ancient History.** Throughout the year. Credit six hours for the year; upperclassmen four hours only. Textbook, lectures, and collateral reading. Professor ———. M W, 9, and an hour for quiz sections to be arranged. *Goldwin Smith A.*

11. **The Middle Ages.** First term. Credit three hours. Professor SMITH. M W F, 3. *Goldwin Smith A.*

The history of Christendom from the eve of the Middle Ages to the dawn of the Renaissance (300-1300 A.D.), with special attention to the life of society and the progress of civilization. Lectures and examinations.

12. **The Age of the Renaissance and Reformation.** Second term. Credit three hours. Professor SMITH. M W F, 3. *Goldwin Smith A.*

The political, social, and religious history of Christendom during this age of transition (1300-1600 A.D.), with especial attention to the beginnings of modern life and thought. Lectures and examinations.

14. **The Intellectual History of Modern Times.** Throughout the year. Credit three hours. Professor SMITH. T Th S, 11. *Goldwin Smith 234.*

While this course is primarily a history of science from the time of Copernicus (1543) to the present, account will be taken of the progress of ideas, among the educated classes of Western Europe and of America, as reflected in literature, in philosophy, in religion, and in art. Open to juniors, seniors, and graduates. Lectures and reports.

16. **Paleography.** First term. Credit two hours. Professor SMITH. M, 10. *Library, European History Seminary Room.*

Reading knowledge of Latin required. Open to graduates and qualified seniors. First meeting October 8.

17. **Historical Method.** Second term. Credit two hours. Professor SMITH. M, 10. *Library, European Seminary Room.*

An introduction to the sciences ancillary to history. Reading knowledge of German required. Open to graduates and qualified seniors.

[18. **Church History.** Throughout the year. Credit two hours. Professor SMITH.] Not given in 1923-24.

*May not be counted for upperclass group.

22. **History of Modern Europe.** Throughout the year. Credit three hours a term. Professor BECKER. M W F, 3. *Goldwin Smith* 242.

A survey of European history from the beginning of the seventeenth century to the present. Political, economic, and intellectual movements will be emphasized in proportion to their international or European character and importance.

23. **The French Revolution.** First term. Credit two hours. Professor BECKER. T Th, 3. *Goldwin Smith* 242.

A study of the revolution from 1789 to 1795, with a preliminary survey of conditions in France before 1789. An elementary knowledge of modern European history is assumed, and a reading knowledge of French will be found of great advantage. The work of the course will consist of informal lectures, discussions, and the preparation of a paper by each student.

[24. **The Napoleonic Era.** Second term. Credit two hours. Professor BECKER.] Not given in 1923-24.

25. **The Federation of Europe.** Second term. Credit two hours. Professor BECKER. T Th, 3. *Goldwin Smith* 242.

A study in the rise of the idea of European federation in modern times. Especial attention will be given to such projects for European federation as the so-called *Grand Design* of Henry IV, Saint-Pierre's *Projet pour rendre la paix perpétuelle*. Kant's *Cosmo-politico History*, Alexander's *Holy Alliance*, etc. The object of the course is to present the intellectual antecedents of the present League of Nations. Open to students who have had course 22, and to such others as obtain the permission of the instructor.

28. **Seminary in Modern European History.** Throughout the year. Credit two hours a term. Professor BECKER. *Library, European History Seminary Room.* Hour to be arranged.

An opportunity for advanced students to undertake special investigation from the sources in some subject connected with the French Revolution or the intellectual history of the eighteenth century. Open to graduates and to properly qualified seniors.

*31. **English History.** Throughout the year. Credit six hours for the year; upperclassmen four hours only. No credit for first term alone. First term, 1066-1689; second term, 1689-1923. An outline of political, social, and constitutional history. Textbooks, lectures, and assigned readings. Professor NOTESTEIN. T Th, 10, and a third hour for recitation. *Goldwin Smith* A.

33. **English History, 1763-1858.** First term. Credit three hours. Prerequisite, course 1 or 31, or an equivalent satisfactory to the instructor. Professor NOTESTEIN. M W F, 10. *Goldwin Smith* 242.

Emphasis will be laid upon cabinet and party development, colonial policy, upon the Industrial Revolution, and the social and parliamentary reform following 1815. Lectures, assigned readings, and reports.

34. **English History, 1858-1923.** Second term. Credit three hours. Prerequisite, course 31, or an equivalent satisfactory to the instructor. Professor NOTESTEIN. M W F, 10. *Goldwin Smith* 242.

Political, social, and diplomatic history. A recitation course with assigned reading and reports.

40. **Anglo-German Relations, 1900-1914.** First term. Credit two hours. Professor NOTESTEIN. A research course open only to selected seniors and graduate students.

41. **Selected Topics in English History, 1640-1660.** Second term. Credit two hours. Professor NOTESTEIN. A research course open only to graduate students.

42. **Seminary in Editing Manuscripts.** First term. Credit two hours. Hours to be arranged. Professor NOTESTEIN. Open only to graduate students and by special permission.

*May not be counted for upperclass group.

43. **Seminary in English Parliamentary Procedure, 1603-1642.** Second term. Credit two hours. Hours to be arranged. Professor NOTESTEIN. Open only to graduate students and by special permission.

[51. **Colonial Constitutional History.** First term. Credit three hours. Professor HULL.] Not given in 1923-24.

*52. **American History, 1763-1850.** First term. Credit three hours; upperclassmen two hours only. Professor HULL. M W F, 9. *Goldwin Smith C.*

The Revolution; formation of new national governments; European complications; domestic problems; the rise of sectional parties. Textbook, lectures, and readings. Primarily for sophomores.

*53. **American History, 1850-1914.** Second term. Credit three hours; upperclassmen two hours only. Professor HULL. M W F, 9. *Goldwin Smith C.*

Secession and civil war, reconstruction, recent political and constitutional history. Textbook, lectures, and readings. Prerequisite, course 52. Primarily for sophomores.

54. **Economic History of the United States to 1815.** First term. Credit three hours. Prerequisite, course 1, 31, 52 or 53, or Economics 51. Professor HULL. M W F, 11. *Goldwin Smith 234.*

Colonization and settlement as business enterprises; the agriculture of the coast; the competition between slave, indentured, and free labor; commerce during the revolutionary wars.

55. **Economic History of the United States since 1815.** Second term. Credit three hours. Prerequisite, course 54 or an accepted equivalent. Professor HULL. M W F, 11. *Goldwin Smith 234.*

Public lands and the westward movement; transportation, manufactures, and the differentiation of the sections; agriculture for export; the amalgamation of railways and the combination of industries; government control.

56. **Constitutional History of the United States.** Second term. Credit three hours. Professor BRETZ. M W F, 9. *Goldwin Smith 234.*

The course deals with the leading constitutional questions since the Civil War. The constitutional aspects of current political questions are also studied. Prerequisite, six hours of history in this college. *Upperclassmen only.

[58. **Foreign Relations of the United States.** Second term. Credit three hours. Professor HULL.] Not given in 1923-24.

59. **American History, 1750-1848: The Settlement of the Middle West.** Second term. Credit three hours. Professor BRETZ. T Th, 9, and an hour to be arranged. *Goldwin Smith 234.* Prerequisite, six hours in history in this college. Upperclassmen only.

60. **American History. Investigation of topics in a selected field.** Second term. Credit two hours. Professor BRETZ. *Library, American History Room.* Monday, 2-4.

Primarily for upperclassmen who have special interest in history and who have had courses 52 and 53. Consult the instructor before registering. First meeting, Monday, February 11, 1924.

61. **Seminary.** Throughout the year. Credit two hours a term. Professor HULL. *Library, American History Room.* Hour to be arranged.

For graduates and open to qualified seniors by permission. First meeting Thursday, October 4, 4 p. m.

76. **The Teaching of History.** Course for teachers. Second term. Credit two hours. Hours to be arranged.

Oriental History. (See Semitic Languages and Literatures, courses 9a, 9b.)

*May not be counted for upperclass group.

LATIN

***A. Elementary Latin.** This course is intended for those who, after entering the University, have come to feel the need of Latin and wish by special effort to acquire a reading knowledge of ordinary prose in a single year. M T W Th F, 8. *Goldwin Smith* 124. Dr. FORMAN. Credit five hours a term. Continuous throughout the year, and no credit will be allowed for the first term alone.

***B. Cicero, Orations; Ovid; Virgil, Aeneid, Books I-VI.** Throughout the year. Credit three hours a term. Prerequisite, course A, or entrance credit for two units of Latin. Dr. FORMAN. M W F, 3. *Goldwin Smith* 120.

1. Freshman Course: Cicero, De Amicitia, De Senectute; Horace, Odes and Epodes. Throughout the year. Credit three hours a term.

Sec. 1. M W F, 10. *Goldwin Smith* 128. Professor DURHAM.

Sec. 2. M W F, 11. *Goldwin Smith* 128. Dr. FORMAN.

Sec. 3. M W F, 12. *Goldwin Smith* 124. Dr. FORMAN.

2. Sight Translation: Gellius, Selections; Ovid, Metamorphoses. Throughout the year. Credit one hour a term. Professor ELMER. Sec. 1, Th, 2. Sec. 2, S, 11. *Goldwin Smith* 124.

Especially recommended as collateral work for those who are taking course 1, but open to all students. Courses 2 and 3 are given in alternate years.

[3. Sight Translation: Caesar's Civil War; Phaedrus. Throughout the year. Credit one hour a term. Professor ELMER.] Not given in 1923-24.

[7. Classic Myths in English Literature. Lectures, translations, and illustrative readings from English literature. Prerequisite, preparatory Latin. Second term only. Credit two hours. Professor DURHAM.] Not given in 1923-24.

This course is not intended as a substitute for any of the regular courses in Latin, and it may not be taken to satisfy the underclass requirement in foreign language.

8. Terence, Phormio and Adelphi; Catullus; Horace, Satires and Epistles; Tacitus, Agricola; Seneca, Letters and Dialogues; Martial. Throughout the year. Credit three hours a term. Prerequisite, course 1. Professor DURHAM. T Th S, 9. *Goldwin Smith* 128.

[11. Selections from Cicero's Letters; Cicero, De Oratore, Book I. Throughout the year. Credit two hours a term. Prerequisite, course 1 or the equivalent. Professor ELMER.] Not given in 1923-24.

12. Selections from the last six books of Virgil's Aeneid; Cicero, De Officiis. Throughout the year. Credit two hours a term. Prerequisite, course 1 or the equivalent. Professor ELMER. W F, 11. *Goldwin Smith* 124.

[16. Selections from the Republican Literature: Plautus, the Aulularia and Menaechmi; Lucretius; Lectures on the History of Roman Literature. Throughout the year. Credit three hours a term. Prerequisite, course 8, or 11, or 12. Professor DURHAM.] Not given in 1923-24.

Courses 16 and 17 are given in alternate years.

17. Literature and History of the Early Empire: Suetonius, Lives of the Caesars; Pliny's Letters; Tacitus, Annals. Throughout the year. Credit three hours a term. Prerequisite, course 8, or 11, or 12. Professor ELMER. T Th S, 10. *Goldwin Smith* 124.

[18. Lyric Poetry. First term. Credit two hours. Open to students who have taken, or are taking, course 16 or 17. Professor DURHAM.] Not given in 1923-24.

[19. Cicero in Verrem. Second term. Credit two hours. Prerequisite, course 8, or 11, or 12. Professor ELMER.] Not given in 1923-24.

*May not be counted for upperclass group.

[20. **Cicero's Philippics.** Throughout the year. Credit two hours a term. Prerequisite, course 8, or 11, or 12. Professor ELMER.] Not given in 1923-24.

21. **Latin Writing. Intermediate Course.** Specially recommended to sophomores. Throughout the year. Credit one hour a term. Prerequisite, course 1. Professor ELMER. M, 12, or hour to be arranged. *Goldwin Smith* 124.

[26. **Teachers' Training Course.** Throughout the year. Credit two hours a term. Open to students who have had course 8, or 11, or 12, and have taken or are taking course 16 or 17. First term, Professor ELMER; second term, Professor DURHAM.] Not given in 1923-24.

27. **Ancient Rome: Topography and Architectural Remains.** First term only. Credit two hours. Professor DURHAM. W F, 12. *Goldwin Smith* 128.

28. **Vulgar Latin; Petronius, *Cena Trimalchionis*; Vulgar Latin Inscriptions, including Christian Inscriptions.** First term. Credit two hours. Prerequisite, course 8, or 11, or 12. Professor DURHAM. T Th, 12. *Goldwin Smith* 128.

[40. **Latin Seminary.** The textual, exegetical, and historical study of the works of Virgil and their influence in medieval and modern times. Professor ELMER. For graduates only.] Not given in 1923-24.

41. **Latin Seminary.** The textual and exegetical study of Plautus, or the Orator of Cicero and the doctrine of prose rhythm. Professor DURHAM. T, 2-4, and S, 10. *Greek and Latin Seminary Room.* For graduates only.

The object of the seminary is to familiarize its members with the methods and principles of scholarly research and criticism. The work is, therefore, as far as possible, put into the hands of the students themselves.

[42. **Indo-European Philology.** Professor DURHAM.] Not given in 1923-24.

[43. **History, Aim, and Scope of Latin Studies.** Throughout the year. Professor ELMER. For graduates only.] Not given in 1923-24.

44. **Historical Latin Syntax.** With special reference to the moods and tenses of the Latin verb. Two hours a week through the year. Professor ELMER. W F, 2. *Goldwin Smith* 124. For graduates only.

45. **Latin Writing, Advanced Course.** Throughout the year. Professor ELMER. W, 3. *Goldwin Smith* 124. For graduates and for undergraduates who have taken course 21.

[48. **Vulgar Latin, Advanced Course.** Throughout the year. Professor DURHAM. For graduates only.] Not given in 1923-24.

[50. **Latin Epigraphy.** Throughout the year. Professor DURHAM.] Not given in 1923-24.

MATHEMATICS

Examinations for the removal of conditions in courses 1 to 8 are held in September just before registration, and near the end of each term. For further information regarding the time and place of these examinations students should apply to Professor Ranum.

All students taking any of the courses from 1 to 15 inclusive should go to White 5 on one of the registration days at the beginning of each term for assignment to sections.

Students wishing to take any of the courses numbered above 15 except 82 are asked to meet in White 5 at 3:30 p. m. on the day following the last day of registration of each term to confer with the teachers concerning these courses, and to arrange schedules.

Of courses 1-8 not more than six (6) hours may be taken simultaneously without the special permission of the department.

*1. **Solid Geometry.** Repeated in second term. Credit three hours. First term, T Th S, 10; second term, M W F, 10.

*May not be counted for upperclass group.

*2. **Advanced Algebra.** Repeated in second term. Credit five hours. Daily, exc. S, 9.

*3. **Plane Trigonometry.** Repeated in second term. Credit three hours. First term, M W F, 10; second term, T Th S, 10.

4, 5, 6. **Analytic Geometry and Calculus.** Primarily for students in the College of Engineering. Prerequisite, courses 1, 2, 3, or their equivalent.

4. Credit three hours (discontinued).

5. Daily except S. Credit five hours. Continuation of course 4. First term.

6. Credit three hours. Continuation of course 5. Repeated second term.

5a, 5b. **Analytic Geometry and Calculus.** Primarily for students in the College of Engineering. Prerequisite, courses 1, 2, 3, or their equivalent.

5a. Daily except S. Credit five hours. Repeated second term.

5b. Daily. Credit six hours. Continuation of course 5a. Second term.

7(1), 7(2). **Analytic Geometry and Calculus.** Primarily for candidates for the degrees of A.B. and B.Chem. Prerequisite, courses 1, 2, 3, or their equivalent. Daily except S. These courses are offered each term.

7(1). Credit five hours.

7(2). Credit five hours. Continuation of 7(1).

*8. **Analytic Geometry and Calculus.** Primarily for students in the College of Architecture. Throughout the year. Credit three hours a term. Prerequisite, courses 1, 2, 3, or their equivalent.

*15. **Elementary Course in Higher Mathematics.** Throughout the year. Credit three hours a term. Prerequisite, courses 1, 2, and 3, or their equivalent. Students who have had the equivalent of any part of course 7 may receive only partial credit for the second term. Assistant Professor HURWITZ. T Th S, 9. *White 6.*

Intended for students who do not plan to take many courses in mathematics, but who nevertheless wish to become acquainted with the principal ideas of the subject. The object will be to make clear the fundamental aims, methods, and results of a number of subjects, rather than to develop the technique of any one. The course will deal with the theory of numbers, vector analysis, groups; synthetic geometry, including some topics in projective, non-euclidean, and higher dimensional geometry; analytic geometry, calculus, famous problems of mathematics. Lectures, assigned reading, and exercises.

20. **Teachers' Course.** Throughout the year. Credit three hours a term. Prerequisite, course 7, which may be taken at the same time. Assistant Professor CRAIG. T Th S, 10. *White 5.*

The course will include a review of the methods of proof of important topics in algebra and geometry. An attempt will be made to give perspective to elementary mathematics by showing the co-ordination between the parts.

23. **Modern Higher Algebra.** Throughout the year. Credit three hours a term. Prerequisite, course 7 or its equivalent. Mr. D. S. MORSE.

A study of algebraic equations, determinants, symmetric functions, polynomials, matrices, linear dependence, sets of linear equations, and invariants.

26. **Theory of Forms.** Throughout the year. Credit three hours a term. Prerequisite, courses 23 and 42 or their equivalent. Assistant Professor WILLIAMS.

Algebraic theory of bilinear forms, quadratic forms in n variables and binary forms of higher order. Applications of the theory of forms in Geometry, Theory of Equations, and other branches of Mathematics.

41. **Elementary Differential Equations.** Repeated in second term. Credit three hours a term. Prerequisite, course 7 or its equivalent. T Th S, 12. Dr. REED. *White 27.*

*May not be counted for upperclass group.

42. Advanced Calculus. Throughout the year. Credit three hours a term. Prerequisite, course 7 or its equivalent. Assistant Professor CARVER. M W F, 11. *White* 10.

This course is a study of the processes of the calculus, their meanings and applications. It is designed to furnish a necessary preparation for advanced work in analysis and applied mathematics.

44. Infinite Series. Second term. Credit three hours. Prerequisite, course 7 or its equivalent. Dr. ROBISON.

The theory of convergence and the algebraic and functional properties of series; special types of series; introduction to the study of divergent series.

45. Theory of Functions of a Complex Variable. Throughout the year. Credit three hours a term. Assistant Professor GILLESPIE.

An elementary course in the theory of analytic functions of a complex variable.

48. Calculus of Variations. First term. Credit three hours. Prerequisite, course 42 or its equivalent. Dr. ROBISON.

The study of the calculus of variation as developed by Euler, Legendre, Jacobi, Weierstrass, and Bolza.

49. Analysis Situs. First term. Credit three hours. Prerequisite, course 42 or 61. Assistant Professor MORSE.

An analysis will be made of those fundamental properties of geometric configurations which are invariant under any one to one continuous transformation of the space in which the configuration is contained. Some of the topics to be specially considered are: plane two dimensional regions, the genus of an algebraic curve, knots in space, the Betti numbers and n dimensional geometry.

61. Projective Geometry. Throughout the year. Credit three hours a term. Prerequisite, course 7 or its equivalent. Assistant Professor CRAIG. M W F, 10. *White* 5.

The elements of projective geometry treated synthetically.

62. Advanced Analytic Geometry. First term. Credit three hours. Prerequisite, course 7 or its equivalent. Assistant Professor OWENS. *White* 2.

A study of metric and projective properties of plane curves.

65. Algebraic Geometry. Throughout the year. Credit three hours a term. Prerequisite, courses 42, 61, and 62. Professor SNYDER. *White* 24.

A study of the methods and processes of the theory of algebraic systems of curves and surfaces.

68. Line Geometry. Throughout the year. Credit three hours a term. Prerequisite course 61. Professor RANUM. *White* 9.

An analytic treatment of the linear complex and congruence, with applications to mechanics, followed by an introduction to the differential line-geometry of ruled surfaces and congruences.

80. Differential Equations of Mathematical Physics. Throughout the year. Credit three hours a term. Assistant Professor HURWITZ. T Th S, 10. *White* 6.

The derivation of the differential equations, with appropriate boundary conditions, which arise in certain problems of mathematical physics; the mathematical properties of solutions and the physical meaning of these properties. No previous work in solving differential equations is required, but course 42 or its equivalent is essential.

81. Introduction to Mathematical Physics. First term. Credit three hours. Professor SHARPE. M W F, 10. *White* 27.

Selected topics in functions of a real variable, functions of a complex variable, differential equations and calculus of variations.

***82. Introduction to the Mathematics of Finance.** Repeated in the second term. Credit two hours. Professor TANNER. M F, 12. *White* 28.

*May not be counted for upperclass credit.

Designed primarily for students in accounting, finance, and actuarial work.

88. The Restricted Problem of Three Bodies. Second term. Credit three hours. Prerequisite, course 42. Assistant Professor MORSE.

The classical problem of three bodies will be studied from the point of view of the recent advances in the theory of dynamical systems by Levi-Civita, Poincaré, Birkhoff, and others. Recurrent motions, periodic motions, and motions asymptotic to periodic motions will be considered in particular.

89. Hydrodynamics and Elasticity. Second term. Credit three hours. Prerequisite, course 7, or its equivalent. Professor SHARPE. *White 27.*

This course is intended primarily for students in Physics and Engineering.

The following additional courses are offered at intervals of two to three years: Theory of Numbers, Theory of Groups, Functions of a Real Variable, Integral Equations, Differential Geometry, Theory of Probability, Vector Analysis, Fourier's Series and Potential Functions.

MUSIC

The courses offered by the Department of Music are designed to afford to all students, having sufficient native ability, the opportunity to study music as a part of the college course. The aim is to make musical training contribute to liberal culture.

Credit for courses 1 to 7 inclusive may be counted as part of the thirty hours which a student may elect outside the College of Arts and Sciences, but may not be counted as part of the ninety hours required in the College. (See paragraph 1, p. xi.)

Individual examinations for admission to all courses in music by new students and others not previously classified will be held in Sage Chapel, daily, Wednesday to Saturday, September 26, 27, 28, 29, from 10 to 12:30 a. m. There will also be individual examinations for membership in the Advanced Choir, Course 7, in Sage Chapel, daily, Monday to Thursday, October 1, 2, 3, 4, from 4:30 to 5:30 p. m.

1. Elementary. Throughout the year. Credit two hours a term. Open to all students showing sufficient aptitude to pursue the subject with profit. Assistant Professor QUARLES. W, 4:45 p. m.; T, 7:15 p. m. *Sage Chapel.*

Ear training, elementary sight reading, and elementary theory, including the construction of the major scale; normal, harmonic, and melodic minor scales; notation of chromatic scale with each key signature; musical dictation and intervals; the elements of musical design and phraseology; voice training and part-singing. The chief purpose of this course is to train the musical faculties of the student in order to furnish a basis for discriminating, musical listening. The course, or its equivalent, is fundamental to all other courses in music. Attendance is required at the Sunday morning service in Sage Chapel, for which service the members of this class form the choir. This course is primarily for freshmen.

7. Advanced Choir. Throughout the year. Credit four hours on completion of the year's course. Assistant Professor QUARLES. M, 7:15; T, 4:45; Sunday, 2:30. *Sage Chapel.*

This course may not be repeated for credit.

Preparation and presentation of the best choral works. This course is offered as advanced training to students possessing good singing voices and the ability to read at sight music of moderate difficulty. The class is limited to ninety members distributed approximately as follows: twenty-seven sopranos, twenty contraltos, eighteen tenors, and twenty-five basses. All vacancies are filled by competition.

10. Harmony. Throughout the year. Credit three hours a term. Prerequisite, course 1 or the equivalent. Assistant Professor QUARLES. M W F, 11. *Sage Chapel.*

A course dealing with the construction and interconnection of triads and their inversions, chords of the Seventh and their inversions, chords of the Ninth, chromatic harmony, suspensions, and ornamental tones, harmonizing both bass and soprano melodies. This course is for sophomores.

11. Elementary Form. First term. Credit two hours. Assistant Professor QUARLES. Prerequisite, course 10 or the equivalent. M W, 10. *Sage Chapel*.
A course in musical construction. It deals with the fundamental principles of musical form, and with the relation of design and plan to musical composition.

12. The Dance Forms. Second term. Credit two hours a term. Prerequisite, course 11 or the equivalent. Assistant Professor QUARLES. M W, 10. *Sage Chapel*.

A course dealing with the principles underlying the construction of the various dance forms, e.g., the sarabande, gavotte, minuet, bourrée, waltz, polonaise, march, theme, and variations, and song forms.

16. Counterpoint. Throughout the year. Credit two hours a term. Assistant Professor QUARLES. Open to students who have completed course 10, and to others equally qualified. T Th, 10. *Sage Chapel*.

A course dealing with the principles of melodic combination.

20. Form and Design in Music. Throughout the year. Credit two hours a term. Prerequisite, course 1 or the equivalent. Assistant Professor QUARLES. T Th, 11. *Sage Chapel*.

A course in musical analysis, designed for the purpose of furnishing a rational basis for the intelligent understanding of music. The course will undertake an analysis and discussion of the various qualities which are necessary to musical beauty, and of the figures of musical speech so frequently employed by the great composers.

[21. History of Music. Throughout the year. Credit two hours a term. Assistant Professor QUARLES.] Not given in 1923-24.

PHILOSOPHY

***1. Problems of Philosophy.** First term. Credit three hours. Lectures. Professor THILLY. M W, 11. *Goldwin Smith* 225. Recitations, Professor THILLY, Dr. PAINE, and ———. F, 11. *Goldwin Smith* 223, 225, 227.

The fundamental problems of philosophy, together with a critical study of the most important types of philosophical theory.

***2. Logic.** First term. Credit three hours. Dr. PAINE. M W F, 12. *Goldwin Smith* 227.

This course will cover practically the same ground as course 3, which is given in the second term. More emphasis will, however, be laid upon the criticism and construction of various forms of argument both deductive and inductive.

***3. Logic.** Second term. Credit three hours. Professor CREIGHTON. T Th S, 11. *Goldwin Smith* 225. Dr. PAINE. T Th S, 9. *Goldwin Smith* 227.

The general character of the thinking process, its laws of development, and the methods by which thought actually proceeds to solve problems presented to it; the analysis of logical arguments and the detection of fallacies, in both the deductive and the inductive processes of reasoning. Creighton's *Introductory Logic* will be used as a textbook.

***4. The Fine Arts; their Philosophy and History in Outline.** First term. Credit three hours. Professor HAMMOND. T Th S, 10. *Goldwin Smith* 225.

An elementary course on aesthetics. Lectures, assigned readings, and examinations.

4a. The Renaissance. Second term. Credit three hours. Professor HAMMOND. T Th S, 10. *Goldwin Smith* 225.

Lectures and assigned readings. A philosophical study of the civilization of the Renaissance, with special reference to the fine arts, the rise of humanism, and the beginnings of modern philosophical and political theories.

5. History of Philosophy. Throughout the year. Credit three hours a term. Professor CREIGHTON. T Th S, 9. *Goldwin Smith* 225.

*May not be counted for upperclass group.

The history of philosophical speculation from its origin among the Greeks to the present time; the various philosophical systems in their relation to the science and general civilization of the ages to which they belong, and their application to social, political, and educational problems; the speculative problems of the present century, and especially the philosophical meaning and importance of the notion of evolution or development. Reading will be assigned from time to time but there will be no class textbook. Open to juniors, seniors, and graduates.

5a. **Supplement to 5.** Two hours. Time to be arranged. For honor students and others who have the necessary qualifications. Lectures, discussions, and reports on reading, running parallel to and supplementing the instruction given in course 5. Professor CREIGHTON.

*6. **Moral Ideas and Practice.** Second term. Credit three hours. Professor THILLY. M W F, 11. *Goldwin Smith* 225. F, 11. *Goldwin Smith* 227.

The evolution of moral ideas and practice from primitive times to the present, with an examination of the fundamental virtues.

7. **Ethics.** First term. Credit three hours. Professor THILLY. M W F, 10. *Goldwin Smith* 225.

A study of the moral consciousness and of the principles of human conduct in their relations to the individual and society. Open to juniors, seniors, and graduates.

7a. **Social and Political Ethics, and the Philosophical Theory of the State.** Second term. Credit three hours. Professor THILLY. M W F, 10. *Goldwin Smith* 225. Open to juniors, seniors, and graduates.

9. **Philosophical Ideas in Nineteenth Century Literature.** First term. Credit three hours. Professor ALBEE. M W F, 12. *Goldwin Smith* 225.

This course does not presuppose previous acquaintance with philosophy. After considering the tendencies of eighteenth century thought, particularly as represented by British empiricism, the course will deal with the interpretations of life offered by well-known authors of the nineteenth century, English, continental, and American, and the relation of such interpretations to the recognized tendencies of contemporary philosophy.

9a. **The Philosophy of William James.** Second term. Credit two hours. Professor ALBEE. M W, 12. *Goldwin Smith* 225.

A study of pragmatism as developed in the writings of William James. Lectures and discussions. Primarily for juniors and seniors.

[*11. **Philosophical Results and Applications.** Professor CREIGHTON.] Not given in 1923-24.

13. **Origin and Development of Religious Ideas.** First term. Credit two hours. Dr. PAINE. T Th, 12. *Goldwin Smith* 225. Not open to underclassmen.

The origin of religious belief and the conditions of its development, with a brief examination of various forms of primitive religion; the history and significance of the more highly developed religions, such as Brahmanism, Buddhism, Judaism, Mohammedanism, and Christianity.

14. **Psychology and Philosophy of Religion.** Second term. Credit two hours. Dr. PAINE. T Th, 12. *Goldwin Smith* 225. Not open to underclassmen.

Psychological analysis of some of the more important types of contemporary individual and social religious experience; relation of religion to science; the question of the place of religion in a philosophical account of the world.

16. **Reading of Philosophical German.** Throughout the year. Credit two hours a term. Professor HAMMOND. F, 2-4. *Goldwin Smith* 220.

The text for class use will be Windelband's *Platon*.

17. **Sources of Ancient and Medieval Philosophy.** Second term. Credit two hours. Professor HAMMOND. M W, 11. *Goldwin Smith* 220.

*May not be counted for upperclass group

Critical examination of the sources; lectures on historical problems, and discussions.

Primarily for graduates, and open to seniors only by special permission.

[18. **Types of Metaphysical Theory.** First term. Credit two hours. Pre-requisite, courses 1 and 5 or the equivalent. Professor CREIGHTON.] Not given in 1923-24.

19. **The Development of Modern Philosophical Problems.** Credit two hours. For graduate students and seniors who have had course 5. Professor CREIGHTON. T Th, 12.

20. **History of Ethics, Ancient, Medieval, and Renaissance.** First term. Credit two hours. Professor HAMMOND. M W, 11. *Goldwin Smith* 220. Lectures and assigned readings. Primarily for seniors and graduates.

21. **History of Modern Ethics.** Second term. Credit two hours. Professor ALBEE. M W, 11. *Goldwin Smith* 227.

The history of modern ethics with special reference to the commonly recognized methods of ethics. The history of British ethics will receive particular attention as illustrating the gradual differentiation of ethics as an independent science or philosophical discipline. Primarily for seniors and graduates.

[26. **The Ethics of Modern Utilitarianism.** Throughout the year. Credit three hours a term. Professor THILLY. Open to qualified seniors and graduates.] Not given in 1923-24.

27. **The Republic of Plato.** Throughout the year. Credit three hours a term. Professor HAMMOND. Reading of the Greek text. M W F, 10. *Goldwin Smith* 222. This course is intended for students of Greek literature as well as of Greek philosophy.

29. **Modern Idealistic Theories of Ethics.** Throughout the year. Credit three hours a term. Professor THILLY. Th, 3-5:30. *Goldwin Smith* 220. Primarily for graduates.

30. **Empiricism and Rationalism.** First term. Credit three hours. Professor ALBEE. T Th S, 11. *Goldwin Smith* 220.

Lectures and discussions. The empirical movement as represented by Locke, Berkeley, and Hume and the rationalistic movement as represented especially by Leibniz. Primarily for graduates.

31. **The Critical Philosophy of Kant.** Second term. Credit three hours. Professor ALBEE. T Th S, 11. *Goldwin Smith* 220.

Lectures and discussions. A study of the *Critique of Pure Reason* and of the *Critique of Judgment* with frequent references to standard commentaries and to more recent interpretations. Primarily for graduates.

32. **Early Rationalism. Spinoza and Leibniz.** Second term. Credit two hours. Professor ALBEE. T Th, 12. *Goldwin Smith* 220.

A critical study of early Rationalism with special reference to the divergent tendencies represented by Spinoza and Leibniz. Primarily for graduates.

33. **The Philosophy of Bergson.** First term. Credit two hours. Professor ALBEE. T Th, 12. *Goldwin Smith* 220.

Bergson's principal works will be examined with a view to estimating the significance of his method for recent philosophy. Primarily for graduates.

[34. **Modern British Idealism.** First term. Credit two hours. Professor ALBEE.] Not given in 1923-24.

37. **Seminary in Ethics.** Throughout the year. Credit two hours a term. Professor THILLY. Hours to be arranged. *Goldwin Smith* 220. Fundamental Concepts of Ethics.

38. **Seminary in Ancient and Medieval Philosophy.** Throughout the year. Credit two hours a term. Professor HAMMOND. M, 3-5, or hours to be arranged. *Goldwin Smith* 220.

The work is devoted to the reading and discussion of selected dialogues of Plato and the *Politics* of Aristotle in English translation.

40. **Seminary in Logic and Metaphysics.** T, 3-5. *Goldwin Smith* 231. Professor CREIGHTON.

The subject for 1923-24 will be announced at the beginning of the year.

41. **Seminary in Aesthetics.** Historical study of aesthetic theories. Throughout the year. Credit two hours a term. Professor HAMMOND. Hours to be arranged. Open to seniors by permission.

PHYSICAL EDUCATION

The following courses have been designed not only to train teachers and supervisors of physical education, but also to train directors for physical and social welfare departments in connection with large banking and industrial plants, and for specialized work in public and private institutions of various kinds. For students interested in this field a four-year undergraduate course has been outlined and may be secured upon application from the Secretary of the College.

20a. **History and Literature of Physical Education.** For juniors and seniors. First term. Credit three hours. Lectures, T Th, 8. *Goldwin Smith* 236. Three hours of practice at hours to be arranged. Professor YOUNG and Miss BATEMAN.

A study of the distinguishing characteristics of various peoples, as to habits of living and forms of physical activity and the part these have played in their national development. The practice work of courses 20a and 20b will consist of lower grade methods (gymnastic stories, rhythm, singing games, marching, and freehand work), and assigned hours of teaching in outside schools.

20b. **Theory of Physical Education and Methods of Teaching.** For juniors and seniors. Second term. Credit three hours. Lectures, T Th, 8. *Goldwin Smith* 236. Three hours of practice at hours to be arranged. Professors JORDAN and YOUNG, and Miss BATEMAN.

A study of the objects and scope of physical education, and of the principles and technique involved in its teaching (including arrangement, classification, and progression of exercises, etc.).

21. **Theory, Organization, and Administration of Gymnastic Play and Athletics.** For juniors and seniors. First term, women; second term, men. Credit two hours. Lectures, F S, 8. *Goldwin Smith* 236. Professors YOUNG and JORDAN.

Study of the social and educational value of play, with special emphasis upon the management and supervision of recreation centers and camps and of the various forms of athletic sports in schools and colleges (football, baseball, track, etc.).

22a. **School and Industrial Hygiene.** For juniors and seniors. First term. Credit two hours. T Th, 12. *Stimson*. Professor YOUNG.

Sanitary aspects of school and factory environment, with methods and scope of health instruction and supervision.

22b. **Physical Inspection.** For juniors and seniors. Second term. Credit two hours. T Th, 12. *Stimson*. Professor YOUNG and Dr. BRITTON.

Study of defects and deformities most commonly met with in the school, and the nature, causes, and symptoms of the more common diseases. Also first aid measures to be applied in cases of emergency.

23a. **Kinesiology, Physiology, and Prescription of Exercise.** For seniors. First term. Credit three hours. Lectures, M W, 8. *Goldwin Smith* 236. Three hours of practice at hours to be arranged. Professor YOUNG and Dr. GOULD.

Study of the anatomical mechanism of movements, and of the technique and effects of therapeutic gymnastics, corrective appliances, and massage.

23b. **Principles of Physical Education.** For seniors. Second term. Credit three hours. Lectures, M W, 8. *Goldwin Smith* 236. Three hours of laboratory at hours to be arranged. Professors OGDEN, YOUNG, and WAKEMAN.

A study of the physical basis of education and the normal growth rates in children and adolescents, and the various factors by which these are affected. History and uses of anthropometry, with tests and measurements in common use.

PHYSICS

Students expecting to elect Physics for their upperclass group are advised to complete Mathematics 7 or its equivalent before the beginning of their junior year.

Students desiring to follow Physics as a profession either in education or in research or testing laboratories should consult with the Department concerning the opportunities in these fields. The members of the department will be glad to advise such students regarding the courses best suited to their needs.

Examinations for those who were unavoidably absent from either term examination in courses 2 to 7 and for those who have conditions to make up will be held on Wednesday, Sept. 26, 1923, at 9 a. m. in Rockefeller A. Similar examinations in connection with courses 8 to 14 will be held in Rockefeller A at 2 p. m. on the same day. Students expecting to take any of these examinations should notify the department not later than Sept. 19, 1923.

Entrance Physics is not accepted as an equivalent of any of the courses offered by the department.

GENERAL COURSES

***3. Introductory Experimental Physics.** Primarily for students in Arts and Sciences. Repeated in second term. Credit six hours. Three lectures, two recitations, one two-hour laboratory period a week. Lectures, T Th S, 9; or T Th S, 11. *Rockefeller A.* First term, Assistant Professor HOWE; second term, Professor MERRITT. Classroom and laboratory work. Recitations: M W, 9, 10, 11; T Th, 8, 12. Laboratory as arranged. Assistant Professor HOWE and Messrs. BAYLEY, COTTRELL, HANSON, MARTEN, NOYES, RUSSELL, and STANTON.

***5. Introductory Physics.** For candidates for B.Chem. only. Repeated in second term. Credit five hours. Three lectures and two recitations a week. Lectures T Th S, 9; or T Th S, 11. *Rockefeller A.* Recitations as arranged. Instructing staff as in Physics 3.

***6. Introductory Physics.** Repeated in second term. Credit six hours. Required of students in engineering. The equivalent of Mathematics 1-3 is a prerequisite for this course, and entrance physics is desirable. Three lectures and three recitations. Lectures, M W F, 11. *Rockefeller A.* Recitations as arranged. Professor GIBBS, Assistant Professor COLLINS, and Messrs. ———, ———, and ———.

***7. General Physics.** Recitations and problem work. Primarily for students in engineering. Repeated in the second term. Credit three hours. Prerequisite course 2. Hours as assigned. *Rockefeller.* Assistant Professor COLLINS and Messrs. FISHER, MAY, PIERCE, SCOTT, WILBER, and WOLFF.

8. Heat and Light. Theory and problems. Required of candidates for B. Chem. First term. Credit two hours. Prerequisite course 3 and Mathematics 7(1). Two classroom periods a week. M W, 10; T Th, 8. *Rockefeller.* Assistant Professor BIDWELL and Mr. ———.

9. Magnetism and Electricity. Theory and problems. Required of candidates for B.Chem. Second term. Credit two hours. Prerequisite course 3 and Mathematics 7(2). Two classroom periods a week. M W, 10; T Th, 9. *Rockefeller.* Assistant Professor BIDWELL and Mr. ———.

11. General Physics. Theory and problems covering selected topics in mechanics, heat, light, electricity. Required of candidates for M.E. and E.E. Second term. Credit three hours. Prerequisite course 7 and Mathematics 6. Three classroom periods as arranged. *Rockefeller.* Assistant Professor BIDWELL and Messrs. NORTHROP, BEHR, MERTZ, and READ.

*May not be counted for upperclass group.

14. Physical Measurements. Required of candidates for B.Chem., M.E., and E.E. Throughout the year, starting either term. Credit two hours a term. One three-hour laboratory period a week. Prerequisite, the calculus and course 7 or 8. Course 11 or 9 must precede or accompany the second half of course 14. Eight sections as assigned. *Rockefeller* 250. Professor RICHTMYER and Messrs. MACKEOWN, BOARDMAN, MERTZ, NORTHROP, PIERCE, READ, REYNOLDS, SCOTT, BEHR, COLE, and BOOTH.

Physical measurements in properties of matter, mechanics, heat, light, sound, magnetism, and electricity; the adjustment and use of instruments of precision. Results and errors are carefully discussed.

45. Brief Survey of Modern Physical Theories. Primarily for students not specializing in Physics. Second term. Credit three hours. Prerequisite, Course 14 and Mathematics 7, or their equivalent. M W F, 11. *Rockefeller* C. Professor RICHTMYER.

A brief historical summary of the development of Physics up to 1900 followed by a discussion of the electromagnetic theory, photoelectricity, electron theory, radiation, X-rays, and the quantum theory and the bearing of these on the structure of the atom and on other problems of modern Physics.

55. Introductory Physical Experiments. (Old number, 10.) Either term. Credit three hours. Prerequisite course 3 or 6. A knowledge of trigonometry is desirable. Two laboratory periods a week, two and one-half hours each, with reports. T Th, 10-12.30, T Th, 2-4.30, W F, 2-4.30. *Rockefeller* 300-B. Assistant Professor TUCKER and Messrs. ABBEY, BAKER, FISHER, M'CORKLE, and MAY.

Fundamental experiments covering properties of matter, heat, light, sound, magnetism, and electricity. Primarily intended for students in the College of Arts and Sciences who wish a general knowledge of experimental physics.

61. General Physics. (Old number, 4a.) Primarily for students in Arts and Sciences. Classroom work covering heat, magnetism, and electricity. First term. Credit three hours. Prerequisite course 3 or 6. M W F, 8. *Rockefeller* 107. Assistant Professor KENNARD.

62. General Physics. (Old number, 4b.) Primarily for students in Arts and Sciences. Classroom work covering properties of matter, sound, and light. Second term. Credit three hours. Prerequisite course 3 or 6. M W F, 8. *Rockefeller* 107. Assistant Professor MURDOCK.

Courses 61 and 62 are designed to meet the needs of students who desire a somewhat detailed survey of the fundamentals of physics. Course 61 may be taken either before or after 62.

65. Physical Measurements. (Old number, 12.) Primarily for students in Arts and Sciences. Either term or throughout the year. Credit two or four hours a term. One or two three-hour laboratory periods a week. Prerequisite, the calculus and course 62. Course 61 should precede the second half of course 65. Professor RICHTMYER and Mr. MACKEOWN.

Quantitative laboratory work in mechanics, heat, light, sound, electricity, and magnetism, with special reference to methods of measurement, sources of error and their elimination, the adjustment and use of instruments of precision, graphical methods of interpreting results.

100. Junior Physics Seminary. Throughout the year. Credit one hour a term. Hour to be arranged. Professor RICHTMYER.

A colloquium conducted by juniors and seniors specializing in Physics, open to others who have had the necessary preparation.

105. Advanced Laboratory Practice. Either term. Prerequisite course 65 (4 hours), or the equivalent. One lecture and two laboratory periods a week, credit three hours; Lecture T, 12. Laboratory periods to be arranged. *Rockefeller* 301. Assistant Professor MURDOCK and Mr. WOLFF.

The course is intended for those wishing to take up special topics for detailed experimentation, for those taking courses 111 to 140 and desiring to supplement

them in the laboratory, and for those preparing to do research work and wishing to develop laboratory technique. Considerable time will be spent on each of a small number of experiments selected to meet the requirements of the individual student. The lectures will include an introductory discussion of the theory of measurements and the application of the theory to laboratory problems.

106. Advanced Laboratory Practice. Either term or throughout the year. A continuation of the laboratory work of Course 105. Credit one to three hours a term depending on the amount of work done. Assistant Professor MURDOCK.

In certain fields of experimentation other members of the department will cooperate in directing the work.

[**111. Mechanics and Properties of Matter.** (Old number, 23a.) First term. Credit three hours. Prerequisite, courses 61, 62, and 65 (2 hours), and Mathematics 7, or their equivalent. M W F, 8. Assistant Professor MURDOCK.] Not given in 1923-24.

[**112. Properties of Matter.** Second term. Credit three hours. A continuation of Course 111. Assistant Professor MURDOCK.] Not given in 1923-24.

120. Electricity and Magnetism. (Old number, 22.) Throughout the year. Credit three hours a term. Prerequisite courses 61, 62, and 65 (4 hours), and Mathematics 7, or their equivalent. M W F, 8. Professor RICHTMYER.

A study of the fundamentals of electricity and magnetism based upon Starling's *Electricity and Magnetism for Advanced Students*.

Courses 111, 112, and 120 are given in alternate years.

[**130. Light.** (Old number, 21.) Second term. Credit three hours. Prerequisite, courses 62, 65 (2 hours), and Mathematics 7, or their equivalent. Assistant Professor COLLINS.] Not given in 1923-24.

140. Heat. Second term. Credit three hours. Prerequisite, courses 61, 62, and 65 (2 hours), and Mathematics 7, or their equivalent. T Th S, 10. *Rockefeller C.* Assistant Professor MURDOCK.

A general survey the results of experimentation in heat based upon Poynting and Thomson's *Heat*. An elementary discussion of thermodynamics and the kinetic theory and their use in interpreting experimental results.

Courses 130 and 140 are given in alternate years.

160. Wave Motion and Sound. First term. Credit three hours. Prerequisite, courses 111 and 112, or their equivalent. T Th S, 10. *Rockefeller C.* Assistant Professor MURDOCK.

The general properties of wave motion will be considered in connection with a comparative study of elastic waves, waves on the surface of liquids, and electromagnetic waves, and a more detailed study of sound based upon Barton's *Textbook on Sound*. The analytical treatment will in general be limited to one dimensional vibrations and plane waves.

[**170. Introduction to Modern Physical Theories.** Primarily for Seniors (or first year graduate students) specializing in Physics. First term. Credit three hours. Prerequisite, course 120 or 130. Professor RICHTMYER.] Not given in 1923-24.

Courses 160 and 170 are given in alternate years.

211. Mechanics. Primarily for graduates. Throughout the year. Prerequisite, course 111. T Th S, 8. First term, Professor MERRITT; second term, Assistant Professor KENNARD.

During the latter half of the second term part of the class will take up fluid motion while the remaining members (meeting M W F, 8, or as arranged) will continue with Higher Mechanics.

[**220. Electricity and Magnetism.** Primarily for graduates. Throughout the year. Prerequisite, course 120 or the equivalent. T Th S, 8. Assistant Professor KENNARD.] Not given in 1923-24.

230. Physical Optics. Primarily for graduates. First term or throughout the year. Prerequisite, course 130 or the equivalent. M W F, 8. Assistant Professor HOWE.

The wave theory of interference, diffraction, and polarization; the electromagnetic theory of dispersion, absorption; magneto-optics. Based on the treatments of Preston and Drude.

[**240. Applications of Thermodynamics in Physics.** Primarily for graduates. First term. Two hours a week. M W, 8. Professor MERRITT.] Not given in 1923-24.

300. Physics Seminary. Throughout the year. Credit one hour a term. M, 3:30. Professor MERRITT.

SPECIAL TOPIC COURSES

[**401. Theory of Measurements.** First term. Credit two hours. Prerequisite, course 105 or its equivalent. Assistant Professor MURDOCK.] Not given in 1923-24.

405. Application of Mathematics to Physics. For graduates only. First term, 2-3 hours a week. Prerequisite, an advanced course in mathematics. Assistant Professor KENNARD.

Practice problems and thorough discussion; topics chosen by the class.

410. Relativity. Primarily for graduates. Second term. S, 10. *Rockefeller* 106. Assistant Professor KENNARD.

Lectures and assigned readings on the origin and experimental basis of Einstein's Relativity, and on related questions as to the properties of space and time.

415. Special Topics. For graduates.

Reading in any branch of physics, experimental or theoretical, under the guidance of some member of the staff, supplemented by reports and regular conference. In theory, possible topics among many are elasticity, fluid motion, theory of sound, the electromagnetic field; or a narrower field, including its recent developments, may be chosen, especially by a student whose major subject is theoretical physics.

425. Aerodynamics and the Mechanics of Flight. Second term. Credit two hours. Prerequisite, course 14. M F, 10. *Rockefeller* 155. Professor BEDELL.

A study of horizontal flight, climbing, gliding, propellers, airplane characteristics and conditions for stability.

[**473. Kinetic Theory of Matter.** Primarily for graduates. First term. Assistant Professor KENNARD.] Not given in 1923-24.

[**480. Quantum Mechanics.** For graduates. Second term. Some experience with Higher Mechanics and Kinetic Theory will be assumed. T Th S, 10. Assistant Professor KENNARD.] Not given in 1923-24.

505. High Temperature Measurements. First term. Credit three hours. Prerequisite, course 14 or 65. Laboratory, two periods a week as arranged. *Rockefeller* 71. Assistant Professor BIDWELL.

The calibration and use of thermo-junctions, resistance thermometers, radiation and optical pyrometers; the construction of arc and resistance furnaces for the laboratory; a study of properties of materials at high temperatures, with such original problems as time permits.

510. Theory of Temperature Measurements. Primarily for graduates. First term. Two hours a week as arranged. Assistant Professor BIDWELL.

A discussion of the various temperature scales and the application of thermodynamics to radiation and to low temperature thermometry; a review of some of the classical experiments at high and low temperatures, particularly the work of Onnes and others at Leiden.

525. Thermodynamics. Throughout the year. Credit three hours. Prerequisite, Mathematics 7 or its equivalent. Mathematics 42 is advised, though not required, as a preliminary course. Hours to be arranged. Professor TREVOR.

530. Thermal Radiation. Primarily for graduates. First term. T, 10. Assistant Professor KENNARD.

The analysis of radiation; laws of Kirchoff, Stefan-Boltzmann and Wien; Planck's formula and the quantum theory; relations with photo-electricity and luminescence.

551. Principles of Photography. (Old number, 18.) Either term. Credit two hours. Prerequisites, course 3 and Chemistry 101, or their equivalent. One lecture and one three-hour laboratory period a week. Lecture, T, 12. *Rockefeller* B. Laboratory T Th, 2-5 (and W F, 2-5, if registration necessitates). *Rockefeller* 332. Professor RICHTMYER and Mr. RIDDLE.

An introduction to the study of the fundamental physical and chemical principles involved in photography.

555. Advanced Photography. Either term. Hours and credit as arranged. Prerequisite, course 551. Professor RICHTMYER and Mr. RIDDLE.

To meet the needs of those who wish to utilize photography in some specialized field of investigation; or those who wish either to make further study of some phase of the photographic process, or to take up some problem in photographic research.

[**571. Spectroscopy and Luminescence.** Throughout the year. Credit two hours a term. Prerequisite, course 130 or its equivalent. Professor GIBBS.] Not given in 1923-24. Course 571 is given every other year.

[**573. Spectroscopy and Luminescence.** First term. Laboratory. Hours and credit as arranged. Prerequisite, the equivalent of Physics 105 and 130. Professor GIBBS.] Not given in 1923-24.

[**581. Atomic Structure.** For graduates only. First term. Three hours a week. Professor GIBBS.] Not given in 1923-24.

591. X-rays and the Structure of Matter. For graduates. First term. Credit three hours. T Th S, 10. *Rockefeller*. Professor RICHTMYER.

The production and measurement of X-rays, including gamma rays; laws of emission, scattering and absorption; the bearing of these phenomena on atomic structure, crystal structure, quantum theory, and similar problems.

605. Conductivity and Magnetization. For graduates. Second term. T Th, 10. *Rockefeller* 106. Assistant Professor KENNARD.

The electron theory of conductivity, thermo-E. M. F., contact potential and the Hall and allied effects; the modern theory of magnetization.

611. Electric Waves and Oscillations. Experimental lectures. Throughout the year. Credit one hour a term. F, 12. Professor MERRITT.

613. Electric Waves and Oscillations. Laboratory. Second term. Credit one to four hours. Prerequisites, courses 65 and 611, or their equivalent. Professor MERRITT.

[**621. Electrical Conduction in Gases.** Experimental lectures. Throughout the year. Credit one hour a term. Professor MERRITT.] Not given in 1923-24. Courses 611 and 621 are given in alternate years.

625. Measurement of Photo-electric, Thermionic and Ionization Currents. Second term. Credit three hours. Assistant Professor TUCKER.

633. Alternating Currents. First term. Credit two hours. Prerequisite, course 14 or 65. T Th, 11. *Rockefeller* 155. Professor BEDELL.

A study of the underlying principles of alternating electric currents; the development of graphical methods of analysis as a basis for testing and for the solution of practical problems.

634. Electrical Laboratory. Either term or throughout the year. Credit as arranged. Prerequisite, course 14 or 65. Daily 9-1. *Rockefeller*. Professor BEDELL and Dr. HOLMES.

Testing of direct and alternating-current apparatus, and the investigation of special problems. The character of the work will be varied to meet individual needs.

636. **Advanced Alternating Currents.** Second term. Credit two hours. Prerequisite, course 633. T Th, 11. *Rockefeller.* Professor BEDELL.

Discussion of the theory and measurement of alternating currents. A seminary for graduates only.

637. **Theses in Applied Electricity.** Second term, or throughout the year. Credit two to eight hours a term. Prerequisite, course 14 or 65. Hours to be arranged. *Rockefeller.* Professor BEDELL.

PHYSIOLOGY AND BIOCHEMISTRY

*3. **Elementary Human Physiology.** Repeated in second term. Credit three hours. First term, M W F, 10, Professor SIMPSON and assistants. Second term, section A, M W F, 10, Professor SIMPSON and assistants; section B, M W F, 12, Dr. LIDDELL. In registering for this course in the second term students are required to specify the section they desire to attend.

An introductory course for students of the biological sciences; also for students who expect to teach physiology in the secondary schools. The lectures will be fully illustrated by experiments, lantern slides, and diagrams.

6. **Laboratory Work in Physiology.** Repeated in second term. Credit two or more hours. Professor SIMPSON, Dr. LIDDELL, Mr. DYE, and assistants. Five hours a week, hours and days for the first term to be arranged; in second term any hours T Th, between 10 a. m. and 5.30 p. m.

A beginning course in practical physiology. May be taken after or along with course 3.

7. **Seminary.** Second term. Credit one hour. A seminary in physiology and biochemistry is held at which current literature is discussed, and at which the results of original investigations carried on by workers in the laboratories are presented for criticism. Students are required to attend these meetings and to take part in the discussions, and each student is expected to give a communication on at least one occasion during the term.

8. **Advanced Work and Research in Physiology.** Throughout the year. Professor SIMPSON and assistants. Daily. *Stimson Hall, Advanced Laboratory.*

In connection with this course a weekly or fortnightly seminary is held.

[9. **Haematology.** First term. Credit one hour. Prerequisite, course 3. Dr. BURLAGE.] Not given in 1923-24.

14. **Elementary Biochemistry.** First term. Credit three hours. Prerequisite, Chemistry 375 or the equivalent. Assistant Professor SUMNER, Dr. BODANSKY, and Miss GRAHAM. Lectures, M W, 12; conferences, F, 12. *Stimson Hall Amphitheater.*

Designed to impart an elementary knowledge of the substances met with in living, especially animal tissues, and the chief facts of digestion, metabolism, and nutrition.

(Courses 14 and 14a will not be accepted for the requirements of biochemistry in the medical college. Chemistry students are advised to take course 18.)

14a. **Laboratory Work in Biochemistry.** First term. Credit two hours. Open to those who are taking or have taken course 14. Assistant Professor SUMNER, Dr. BODANSKY, and Miss GRAHAM. M W, 2-5.

14b. **Urine and Blood Analysis.** Second term. Credit two hours. Prerequisite, course 14a or the equivalent. Lectures and laboratory. Hours to be arranged. Assistant Professor SUMNER, Dr. BODANSKY, and Miss GRAHAM.

16. **Advanced Biochemistry Lectures.** Throughout the year. Credit one hour a term. Assistant Professor SUMNER and Dr. BODANSKY. S, 8.

*May not be counted for upperclass group.

17. **Special Chapters in Biochemistry.** First term. Credit two hours. T Th, 12. Assistant Professor SUMNER and Dr. BODANSKY.

18. **Biochemistry for Medical Students.** Throughout the year. Credit five hours. Prerequisite, Chemistry 375 or its equivalent. First term, M W, 8, and F, 9. Second term, F S, 9. Assistant Professor SUMNER, Dr. BODANSKY, and Miss GRAHAM.

18a. **Laboratory Work in Biochemistry.** Throughout the year. Credit four hours. Prerequisite, Chemistry 375. First term, T, 2-5; Second term, F, 10-1, 2-5, and S, 10-1. Assistant Professor SUMNER, Dr. BODANSKY, and Miss GRAHAM.

Courses 18 and 18a comprise lectures and experimental work on fats, carbohydrates, proteins, colloids, digestion, and metabolism. The concluding part of course 18a is devoted to modern methods of quantitative urine and blood analysis.

20. **Advanced and Research Work in Biochemistry.** Throughout the year. Daily, 8-6. Assistant Professor SUMNER.

Note—If a sufficient number of students desire a general course in biochemical preparation methods this will be given second term. M W, 2-5. Assistant Professor SUMNER and Dr. BODANSKY.

PSYCHOLOGY

*1. **Elementary Psychology.** First term. Credit three hours. Professors TITCHENER and WELD, Assistant Professor HOISINGTON, Dr. BISHOP, Mr. FELDMAN, and Mr. NAFE. Lectures, T Th, 11. *Goldwin Smith C.* Classroom work, S, 10, or 11.

Not open to juniors or seniors. For sophomores in the College of Arts and Sciences.

*1a. **Elementary Psychology.** First term. Credit three hours. Assistant Professor DALLENBACH and Mr. FELDMAN. Lectures M W, 12. *Goldwin Smith C.* Classroom work, F, 10, 11, or 12. Open to sophomores, juniors, and seniors.

*1b. **Elementary Psychology.** Second term. Credit three hours. Assistant Professor HOISINGTON and Dr. BISHOP. Lectures, M W, 12. *Goldwin Smith C.* Classroom work, F, 10, 11, or 12. Open to sophomores, juniors, and seniors.

2. **General Psychology, Problems and Points of View.** Second term. Credit three hours. Prerequisite, course 1, 1a, or 1b. Professor WELD, Dr. BISHOP, Mr. FELDMAN, and Mr. NAFE. Lectures, T Th, 11. *Goldwin Smith C.* Classroom work, S, 10, 11, or 12.

3. **Experimental Psychology: Qualitative.** Repeated in second term. Credit three hours. Prerequisite, course 1, 1a, or 1b. Professor WELD, Assistant Professors DALLENBACH and HOISINGTON, Dr. BISHOP, Mr. FELDMAN, and Mr. NAFE. M W F, 2-4. *Morrill, Psychological Laboratory.*

4. **Experimental Psychology: Quantitative.** Repeated in second term. Credit three hours. Prerequisite, courses 1, 1a, or 1b, and 3. Professor WELD, Assistant Professors DALLENBACH and HOISINGTON, Dr. BISHOP, Mr. FELDMAN, and Mr. NAFE. M W F, 2-4. *Morrill, Psychological Laboratory.*

5. **Systematic Psychology: Sensation, Image.** First term. Credit three hours. Prerequisite, course 3, or by special permission course 2. Professor WELD and Dr. BISHOP. Lectures, M W F, 9. *Morrill 42.*

[5a. **Systematic Psychology: Perception, Idea.** First term. Credit three hours.] Not given in 1923-24.

6. **Systematic Psychology: Feeling, Attention, Action.** Second term. Credit three hours. Prerequisite, course 3, or by special permission course 2. Assistant Professors DALLENBACH and HOISINGTON. Lectures, M W F, 9. *Morrill 42.*

*May not be counted for upperclass group.

[6a. **Systematic Psychology: Memory, Imagination, and Thought; Emotion and Volition.**] Not given in 1923-24.

7. **Reading of German Psychology.** First term. Credit one hour. Prerequisite, a course in Systematic Psychology. Professor WELD. Hour to be arranged. *Morrill 46.*

8. **Reading of French Psychology.** Second term. Credit one hour. Prerequisite, a course in Systematic Psychology. Professor WELD. Hour to be arranged. *Morrill 46.*

9. **Psychological Problems.** Throughout the year. Credit one to five hours a term. Prerequisite, course 4. Professor WELD, Assistant Professors DALLENBACH and HOISINGTON. *Morrill, Psychological Laboratory.*

For particulars of graduate work see the *Announcement of the Graduate School.*

PUBLIC SPEAKING

1. **Public Speaking.** Throughout the year. Credit three hours a term. Professor DRUMMOND, Assistant Professors MUCHMORE and HUNT, Messrs. CAPLAN, HANNAH, THOMAS, BAUER, and HULTZEN. Sections at the following hours: M W F, 8, 9, 10, 12; T Th S, 8, 10. Rooms to be announced.

Planned to give the fundamentals of speech preparation and to help in the acquisition of a simple, direct manner of speaking. Required readings on selected topics. Individual instruction by appointment.

(The '86 Memorial Prize for declamation is awarded in connection with this course. See pamphlet on Prizes.)

All students intending to take Course 1 must apply at *Goldwin Smith 21* on Friday or Saturday of registration week of each term for assignment to sections.

1a. **Public Speaking.** Second term. Credit three hours. Assistant Professor HUNT, Messrs. CAPLAN, HANNAH, and THOMAS. Room to be announced. Sections at the following hours: M W F, 11; T Th S, 8, 9. This course repeats the work of the first term of Course 1. All students intending to take Course 1a must apply at *Goldwin Smith 21* on Friday or Saturday of registration week for assignment to sections.

*8. **Voice Training.** Repeated in second term. Credit one hour. Assistant Professor MUCHMORE. M W F, 10. *Goldwin Smith 26.*

An elementary course for the improvement of untrained voices, and for the development of flexibility, strength, and purity of tone. Exercises to give poise and freedom to the body. Individual instruction by appointment.

8a. **Voice Training.** Second term. Credit two hours. Prerequisite course 8 and consent of instructor. Assistant Professor MUCHMORE. Hours to be arranged. *Goldwin Smith 26.*

Practice and discussions of assigned readings relating to the science underlying voice training. Especially for teachers.

10. **Oral Reading.** Throughout the year. Credit two hours a term. Assistant Professor MUCHMORE. T Th, 11. *Goldwin Smith 21.*

The aim of the course is simple, intelligent, and expressive reading based on interpretative study of prose, poetry, and drama of assured literary value.

12. **Argument and Debate.** Throughout the year. Credit three hours a term. Prerequisite, course 1 or 1a. Assistant Professor HUNT. T Th S, 12. *Goldwin Smith 21.* Dr. CAPLAN. M W F, 11. *Goldwin Smith 26.*

The application of rules of evidence, types of argument, analysis, detection of fallacies, dialectical method, and parliamentary law to public debate and discussion. Illustrative material will be drawn from the debates on the adoption of the Federal Constitution and from the Lincoln-Douglas campaign.

*May not be counted for upperclass group.

12a. **Argument and Debate.** Second term. Credit three hours. Prerequisite, course 1 or 1a. Dr. CAPLAN. M W F, 9. *Goldwin Smith* 24. Repeats the work of the first term in Course 12.

15. **Persuasion and the Forms of Public Address.** Throughout the year. Credit three hours a term. Open by consent of instructor to those who have had course 1 or 1a. Professor DRUMMOND. M W F, 12. *Goldwin Smith* 26.

Study, composition, and delivery of various types of public discourse; problems of interest, persuasion and rhetorical technique; critical reading of typical masterpieces.

16. **Classical Rhetoric.** First term. Credit three hours. Open by consent of instructor to juniors and seniors who have had course 1, or its equivalent. Assistant Professor HUNT. Hours to be arranged.

Rhetorical theory of Plato, Aristotle, Isocrates, Cicero, and Quintilian.

17. **British Orators.** Second term. Credit three hours. Open by consent of instructor to juniors and seniors who have had course 1, or its equivalent. Assistant Professor MUCHMORE. Hours to be arranged.

An intensive study, including historical and biographical background, of selected British orations and addresses.

[18. **American Orators.** Second term. Credit three hours.] Not given in 1923-24.

20. **Seminary.** Throughout the year. Credit three hours a term. For graduates. Open to seniors by permission. Professor DRUMMOND. Th, 3-6. *Goldwin Smith* 28.

For the study of special subjects in the history, literature, psychology, and pedagogy of public speech.

29. **Oral Expression for Architects.** First term. Credit three hours. (See the *Announcement of the College of Architecture*.)

30. **Dramatic Interpretation.** Throughout the year. Three hours credit for year; no credit for one term alone. Open only to upperclassmen with consent of instructor. Professor DRUMMOND. T, 4-6. *Goldwin Smith* 26.

Training in the direction and production of plays, with emphasis on the oral interpretation of dramatic literature. Practice with Cornell Dramatic Club. This course is especially planned for teachers who may have supervision of dramatics.

ROMANCE LANGUAGES

FRENCH

*1. **Elementary Course.** Throughout the year. Credit three hours a term; for upperclassmen, two hours a term. Mr. ——— in charge. Two sections: M W F, 12; T Th S, 8.

The course is continuous throughout the year and no credit is allowed for the first term alone. Students with first year entrance French should enter the course the second term.

*3. **Advanced Course.** Repeated in second term. Credit six hours; for upperclassmen, four hours only. Prerequisite, course 1, or second year entrance French. Mr. WADSWORTH in charge. First term, three sections: daily, 8, 9, 11. Second term, two sections; daily 8, 12.

*3a. **Advanced Course.** For students in the professional colleges. Throughout the year. Credit three hours a term. Prerequisite, course 1, or second year entrance French. T Th S, 12. *Goldwin Smith* 256.

Not open to students in Arts and Sciences. The course is continuous throughout the year and no credit is allowed for the first term alone.

*May not be counted for upperclass group.

***4a. Advanced Translation.** Repeated in second term. Credit three hours. Prerequisite, course 3, 3a, or third year entrance French. Mr. BISHOP in charge. First term, six sections: M W F, 8; M W F, 9; M W F, 10; M W F, 2; T Th S, 10; T Th S, 11. Second term, four sections: M W F, 11; M W F, 12; T Th S, 8; T Th S, 11.

Translation and outside reading.

Courses 4a and 5a may profitably be taken at the same time.

***4b. Advanced Translation.** Repeated in second term. Credit three hours. Prerequisite, course 4a. Mr. BISHOP in charge. First term, one section: T Th S, 11. Second term, five sections: M W F, 8; M W F, 9; M W F, 10; M W F, 2; T Th S, 10.

Translation and outside reading.

***5a. Elementary Composition.** Repeated in second term. Credit three hours. Prerequisite, course 3, 3a, or third year entrance French. Mr. ARWOOD in charge. First term, four sections: M W F, 11; M W F, 2; T Th S, 9; T Th S, 12. Second term, three sections: M W F, 9; T Th S, 10; T Th S, 11.

***5b. Elementary Composition.** Repeated in second term. Credit three hours. Prerequisite, course 5a. Mr. ARWOOD in charge. First term, one section: T Th S, 11. Second term, two sections: M W F, 11; T Th S, 9.

7a. Intermediate Composition. Repeated in second term. Credit three hours. Prerequisite course 5b. Professor PUMPELLY. First term, two sections: T Th S, 10; M W F, 12. *Goldwin Smith* 277. Second term, two sections: T Th S, 9, *Goldwin Smith* 290; T Th S, 11, *Goldwin Smith* 283.

7b. Intermediate Composition. Repeated in second term. Credit three hours. Prerequisite course 7a. Professor PUMPELLY. First term, one section: M W F, 10, *Goldwin Smith* 277. Second term, two sections: T Th S, 10, *Goldwin Smith* 281; M W F, 12, *Goldwin Smith* 283.

8. Intermediate Composition. Second term. Credit three hours. Prerequisite course 7b. Professor PUMPELLY. M W F, 10. *Goldwin Smith* 290.

Composition, conversation, and discussion of selected topics in French grammar. Courses 7a, 7b, and 8 are conducted in French.

9. Advanced Composition. Throughout the year. Credit three hours a term. Prerequisite course 7b. Professor GUERLAC. M W F, 10. *Goldwin Smith* 283.

Intensive study of French syntax; rapid translation from English; original themes and talks by students on literary and historical topics. The course is conducted in French.

16. History of French Literature. Throughout the year. Credit three hours a term. Prerequisite course 4a. Professor MASON. M W F, 11. *Goldwin Smith* 142.

Lectures on French literature since the Middle Ages.

17. Literature of the Seventeenth Century. Throughout the year. Credit three hours a term. Prerequisite course 16. Professor GUERLAC. M W F, 11. *Goldwin Smith* 290.

[18. Literature of the Eighteenth Century. Throughout the year. Credit three hours a term. Professor GUERLAC.] Not given in 1923-24.

Courses 17 and 18 are usually given in alternate years.

[19. The Romantic Movement in French Literature. Throughout the year. Credit three hours a term. Professor MASON.] Not given in 1923-24.

[20. Modern French Literature. Throughout the year. Credit three hours a term. Prerequisite course 16. Professor MASON.] Not given in 1923-24.

*May not be counted for upperclass group.

21. **Contemporary French Literature.** Throughout the year. Credit three hours a term. Prerequisite, course 16. Professor MASON. M W F, 9. *Goldwin Smith* 234.

[22. **French Phonetics.** Second term. Credit two hours. Professor MASON.] Not given in 1923-24.

23. **French Philology.** Throughout the year. Credit three hours a term. Prerequisite course 5a and entrance Latin. Professor PUMPELLY. Th, 3-5, and one hour to be arranged, *Goldwin Smith* 277.

Lectures on the historical development of the French language, with a detailed phonological and morphological study of the *Chanson de Roland*.

30. **The Teaching of French.** First term. Credit two hours. For seniors and graduates. Professor MASON. M W, 8. *Library, French Seminary Room.*

31. **Prose of the Sixteenth Century.** Second term. Credit one hour. Professor MASON. F, 8. *Library, French Seminary Room.*

[32. **Poetry of the Sixteenth Century.** Second term. Credit one hour. Professor MASON.] Not given in 1923-24.

[34. **French Criticism.** Throughout the year. Credit one hour a term. Professor MASON.] Not given in 1923-24.

35. **French Moralists, Historians, and Critics of the Nineteenth Century.** First term. Credit two hours. Professor GUERLAC. T Th, 10. *Goldwin Smith* 242. Lectures in French with outside reading and reports.

36. **Lectures in French.** Second term. Credit two hours. Professor GUERLAC. T Th, 12. *Goldwin Smith* 283.

France of to-day. Lectures, outside reading, and reports.

41. **Old French Texts.** Throughout the year. Credit two hours a term. Primarily for graduates. Professor HAMILTON. Hours to be arranged.

47. **Modern French Seminary.** Throughout the year. Credit two hours a term. Primarily for graduates. Professor MASON. T, 3. *Library, French Seminary Room.*

ITALIAN

*1. **Elementary Course.** Throughout the year. Credit three hours a term Professor PUMPELLY. M W F, 9. *Goldwin Smith* 283.

The course is continuous throughout the year and no credit will be allowed for the first term alone.

4. **Modern Italian Literature.** Throughout the year. Credit three hours a term. Prerequisite course 1, or second year Italian of the entrance requirements. Professor HAMILTON. T Th S, 9. *Goldwin Smith* 242.

Translation, outside reading, and discussion of modern novels and plays.

14. **Dante.** First term. Credit three hours. Prerequisite course 4. Professor HAMILTON. M W F, 2. *Goldwin Smith* 281.

Lectures on Dante and the Middle Ages. The *Divina commedia* and the *Vita nuova* will be studied in detail.

15. **Literature of the Renaissance.** Second term. Credit three hours. Professor HAMILTON. M W F, 2. *Goldwin Smith* 281.

[19. **Nineteenth Century Poetry.** Second term. Credit three hours. Prerequisite course 4. Professor HAMILTON.] Not given in 1923-24.

41. **Old Italian.** Second term. Credit two hours. Primarily for graduates. Professor HAMILTON. Hours to be arranged.

*May not be counted for upperclass group.

ROMANCE PHILOLOGY

[1. **Low Latin.** Second term. Credit two hours. Primarily for graduates. Professor HAMILTON.] Not given in 1923-24.

2. **Old Provençal.** First term. Credit two hours. Hours to be arranged. Primarily for graduates. Professor HAMILTON.

5. **Romance Phonetics.** Second term. Credit two hours. For upperclassmen and graduates. Professor KENISTON. Hours to be arranged.

SPANISH

*1. **Elementary Course.** Throughout the year. Credit three hours a term; for upperclassmen, two hours a term. Mr. DOYLE in charge. Three sections: M W F, 8; M W F, 12; T Th S, 8.

The course is continuous throughout the year and no credit is allowed for the first term alone. Students entering with one unit in Spanish should take the second term of course 1.

*3. **Advanced Course.** Repeated in second term. Credit six hours; for upperclassmen, four hours only. Prerequisite course 1, or second year entrance Spanish. Mr. BERKOWITZ in charge. Two sections: daily, 8, 9.

*4a. **Advanced Translation.** Repeated in second term. Credit three hours. Prerequisite course 3, or third entrance Spanish. Mr. DOYLE in charge. First term, three sections: M W F, 8; M W F, 11; T Th S, 12. Second term, two sections: T Th S, 9; T Th S, 10.

Translation, outside reading, and discussion of modern novels and plays. Courses 4a and 5a may profitably be taken at the same time.

*4b. **Advanced Translation.** Repeated in second term. Credit three hours. Prerequisite course 4a. Mr. BERKOWITZ in charge. First term, one section: T Th S, 10. Second term, two sections: M W F, 8; T Th S, 12.

Translation, outside reading, and discussion of representative works of Spanish literature.

*5a. **Elementary Composition.** Repeated in second term. Credit three hours. Prerequisite course 3, or third year entrance Spanish. Mr. ZAPATA Y TORRES. First term, two sections: T Th S, 9; T Th S, 10. Second term, two sections: M W F, 9; M W F, 10.

*5b. **Elementary Composition.** Repeated in second term. Credit three hours. Prerequisite course 5a. Mr. ZAPATA Y TORRES. First term, one section: T Th S, 11. Second term, two sections: T Th S, 9; T Th S, 10.

7a. **Advanced Composition.** Repeated in second term. Credit three hours. Prerequisite course 5b. Mr. ZAPATA Y TORRES. First term, T Th S, 12. *Goldwin Smith 277.* Second term, T Th S, 11. *Goldwin Smith 277.*

7b. **Advanced Composition.** Second term. Credit three hours. Prerequisite course 7a. Mr. ZAPATA Y TORRES. T Th S, 12. *Goldwin Smith 281.*

Courses 7a and 7b are conducted in Spanish. Special emphasis is placed on the attainment of accuracy and fluency in both written and oral expression.

10. **History of Spanish Literature.** Throughout the year. Credit three hours a term. Prerequisite, course 4a. Professor KENISTON. T Th S, 11. *Goldwin Smith 290.*

Lectures, outside reading, and classroom discussions.

[30. **The Teaching of Spanish.** Second term. Credit three hours. For upperclassmen and graduates. Professor KENISTON.] Not given in 1923-24.

33. **The Spanish Novel Since 1830.** Throughout the year. Credit three hours a term. Prerequisite course 4a. Professor KENISTON and Mr. BERKOWITZ. M W F, 10. *Goldwin Smith 281.*

*May not be counted for upperclass group.

Lectures, outside reading, and reports.

41. **Old Spanish.** Throughout the year. Credit two hours a term. Primarily for graduates. Professor KENISTON. F, 2. *Library, French Seminary Room.*

The phonology and morphology of Old Spanish. Study of Old Spanish Texts.

[43. **Seminary.** Throughout the year. Credit two hours a term. Primarily for graduates. Professor KENISTON.] Not given in 1923-24.

SCANDINAVIAN LANGUAGES AND LITERATURES

¶1. **Old Icelandic.** Second term. Credit three hours. Assistant Professor HERMANSSON. T Th S, 11. *Library, Greek and Latin Seminary.*

Grammar; reading of sagas, eddic and skaldic poems. For advanced students and graduates.

[2. **Danish (and Dano-Norwegian).** Throughout the year. Credit two hours a term. Assistant Professor HERMANSSON.] Not given in 1923-24.

3. **Swedish.** Second term. Credit three hours. Assistant Professor HERMANSSON. M W F, 11. *Library, Greek and Latin Seminary.*

Grammar; reading of works by modern Swedish authors.

4. **Norse Mythology.** Second term. Credit two hours. Assistant Professor HERMANSSON. T Th, 9. *Library, Greek and Latin Seminary.*

Lectures and readings.

[5. **Old Norse-Icelandic Literature.** First term. Credit two hours. Assistant Professor HERMANSSON.] Not given in 1923-24.

[6. **Modern Scandinavian Literatures.** Second term. Credit two hours. Assistant Professor HERMANSSON.] Not given in 1923-24.

7. **Early Scandinavian Civilization and History.** Second term. Credit three hours. Assistant Professor HERMANSSON. M W F, 3. *Goldwin Smith 234.*

Lectures on social and political conditions in the Scandinavian countries from the earliest times down to the end of the Middle Ages.

SEMITIC LANGUAGES AND LITERATURES AND ORIENTAL HISTORY

1a. **Hebrew.** Throughout the year. Credit three hours. Professor SCHMIDT. M T Th, 2. *Goldwin Smith 127.*

Open only to juniors, seniors, and graduates.

1b. **Advanced Hebrew.** Throughout the year. Credit two hours. Prerequisite course 1a. Professor SCHMIDT. T Th, 8. *Goldwin Smith 127.*

The Book of Job, and Hebrew meter.

2a. **Arabic.** Throughout the year. Credit two hours. Professor SCHMIDT. T Th, 9. *Goldwin Smith 127.*

Open only to juniors, seniors, and graduates.

2b. **Advanced Arabic.** Throughout the year. Credit two hours. Prerequisite course 2a. Professor SCHMIDT. W F, 2. *Goldwin Smith 127.*

Meccan suras, and Prolegomena of Ibn Khaldun.

3. **Ethiopic.** Throughout the year. Credit two hours. Prerequisite courses 1a, 2a. Professor SCHMIDT. T Th, 3. *Goldwin Smith 127.*

Primarily for graduates.

4a. **Assyrian.** Throughout the year. Credit two hours. Prerequisite courses 1a, 2a. Professor SCHMIDT. T Th, 4. *Goldwin Smith 127.*

- 4b. **Aramaic.** Throughout the year. Credit two hours. Prerequisite course 1a. Professor SCHMIDT. T Th, 5. *Goldwin Smith* 127. Inscriptions, Daniel ii-vii, and the Elephantine Papyri.
- 5a. **Egyptian.** Throughout the year. Credit two hours. Prerequisite courses 1a, 2a. Professor SCHMIDT. W, 4-6. *Goldwin Smith* 127. Hieroglyphic texts. Primarily for graduates.
- 5b. **Coptic.** Throughout the year. Credit two hours. Prerequisite course 5a. Professor SCHMIDT. F, 4-6. *Goldwin Smith* 127. Selections from the Gospels and from Pistis Sophia. Primarily for graduates.
6. **Biblical Literature.** Throughout the year. Credit two hours. Professor SCHMIDT. M W, 3. *Goldwin Smith* 120. General introduction to the Bible. Open to juniors, seniors, and graduates. No knowledge is required of Semitic languages or of Greek.
7. **Semitic Seminary.** Throughout the year. Credit two hours. Prerequisite courses 1a, 4b. Professor SCHMIDT. M, 4-6. *Goldwin Smith* 127. The Psalms and Odes of Solomon in the Syriac, and the Zadokite document.
8. **Comparative Semitic Philology.** Throughout the year. Credit one hour. Professor SCHMIDT. F, 3. *Goldwin Smith* 127. For graduates only.
- 9a. **Oriental History.** Throughout the year. Credit two hours. Professor SCHMIDT. T Th, 10. *Goldwin Smith* 128. A general survey of the History of Asia. Open only to juniors, seniors, and graduates.

ZOOLOGY

*1. **General Zoology.** Throughout the year. Credit three hours a term. Professor REED. Assistant Professor YOUNG, Miss FISHER, Miss MEKEEL, and Miss McMULLEN. Two lectures and one laboratory period weekly. Lectures, *Goldwin Smith* B, Section 1, T Th, 9; Section 2, T Th, 11. Laboratory sections, *McGraw* 2, M T W F, 2-4:30; S, 8-10:30.

A comprehensive view of the subject including the fundamentals of animal biology, the principles of structure, function, origin, and perfection of animal life, and a consideration of generalizations in zoological theory which seem to be the best founded. Animal types and their classification are employed only as a service-base from which study may proceed.

Registration with the department before instruction begins is necessary for the assignment of lecture and laboratory sections.

*1a. **General Zoology.** Second term. Credit three hours. Assistant Professor YOUNG. Lecture, Th, 10. *McGraw* 5. Laboratory, *McGraw* 2, T Th, 2-4:30.

A general survey of the animal phyla with special emphasis on some of the fundamental biological principles. The classification of the larger and economic divisions is included in the course.

Primarily for veterinary students and pre-medical students who enter the University the second semester or change to a pre-medical course at that time. Registration with the department before instruction begins is necessary.

2. **Invertebrate Zoology.** Throughout the year. Credit three hours a term. Assistant Professor YOUNG. Lecture, F, 8. *McGraw* 5. Laboratory, W F, 2-5, *McGraw* 2.

A study of the structure, development, and relationship of, and the application of biological principles to, invertebrate animals. The laboratory work consists of dissections or microscopic study of type forms and observations on living animals. Field periods are devoted to the collection and study of forms peculiar to the local fauna.

*May not be counted for upperclass group.

Registration with the department before instruction begins is necessary.

3. **Comparative Anatomy and Morphology of Vertebrates.** Throughout the year. Credit four hours a term. Prerequisite, course 1 or 1a. Professor REED and Assistant Professor GAMBLE. Lectures, W, 9 (or some other more convenient hour). *McGraw* 5. Laboratory sections: 1, M W F, 2-4:30; 2, T Th, 2-4:30; S, 8-10:30. For students preparing for medicine and major work in animal biology.

The lectures may be taken without the laboratory work for one hour credit a term by those who are qualified. The laboratory work without the lectures may be elected for three hours credit a term.

A thorough dissection and study of the several systems of organs of each class of vertebrates. The lectures consider the various systems with reference to the significance of structure in establishing homologies and the theories of vertebrate phylogeny.

[4. **Protozoology.** Second term. Credit three hours. Prerequisite courses 1 and 2.] Not given in 1923-24.

5. **Systematic Vertebrate Zoology and Ecology.** Throughout the year. Credit three hours a term. Assistant Professor WRIGHT and Mr. ———, Lectures, M, 8. *McGraw* 7. Laboratory, *McGraw* 7. Section 1, M W, 2-4:30; Section 2, T Th, 2-4:30.

Lectures on fishes, amphibians, reptiles, birds and mammals, dealing with the principles of classification and nomenclature; the characters and relationships of these groups; the habits, life histories, and principles of coloration. Laboratory study of the parts employed in classification and a practical identification of species of North American vertebrates. Field work on the various groups is given during the fall and spring.

6. **Field Ornithology.** Second term. Credit three hours. Lecture, W, 11. *McGraw* 5. Field work and laboratory, T Th, 2-4:30, or W F, 2-4:30. Assistant Professor ALLEN and Mr. LEISTER.

This course is intended primarily for students wishing to gain a knowledge of local birds, their habits, songs, nests, and eggs, their relation to agriculture, and the general principles of their conservation. Field work will be supplemented by laboratory studies, and after the first of May field trips will be held at 5.30 a. m.

7. **Ichthyology, Advanced Systematic and Field Zoology.** Second term. Credit three hours. Assistant Professor WRIGHT. Lectures, T Th, 9. *McGraw* 7. Laboratory, F, 2-4:30, or S, 8-10:30.

8. **Herpetology.** First term. Credit three hours. Assistant Professor WRIGHT. *McGraw* 7. Laboratory, F, 2-4:30, or S, 8-10:30.

[9. **Advanced Ornithology.** First term. Credit three hours. Prerequisite, course 5 or 6. Assistant Professor ALLEN.] Not given 1923-24.

[10. **Mammalogy.** First term. Credit three hours. Assistant Professor WRIGHT.] Not given in 1923-24.

11. **Economic Ornithology and Mammalogy.** First term. Credit three hours. Should be preceded by course 5 or 6; presupposes an elementary knowledge of botany and entomology. Lecture, W, 11. *McGraw* 5. Laboratory and field work, T Th, 2-4:30. Assistant Professor ALLEN and Mr. LEISTER.

This course is designed to assist those planning professional work with birds or mammals. The lectures will take up various phases of the life of birds and mammals in relation to agriculture, with the methods of increasing beneficial species and destroying vermin, together with the elements of game breeding, and fur farming. The laboratory will give practice in the identification of game birds, vermin, the food of birds; the preparation of materials and the making of skins. The field work will give opportunity for observation of feeding habits, field collecting, methods of attracting birds, and natural history photography.

12. **Mammalian Anatomy.** Second term. Credit three hours. Prerequisite, course 1. Assistant Professor GAMBLE. Laboratory to be arranged.

This course is designed to present the fundamentals of mammalian structure, to give practice in acquiring manipulative skill in dissection, and to lay a foundation for the study of the human body.

17. **Special Problems and Research.** Throughout the year. Credit one or more hours. For seniors and graduates only. Opportunity is given for the pursuit of special phases of zoological study, further than is permitted by the more elementary courses, and for investigation. Permission necessary for registration.

18. **Seminary in Systematic Vertebrate Zoology.** Throughout the year. Credit one hour a term. Distribution and origin of life in America. First term. Subject to be announced later for second term. Assistant Professor WRIGHT. Hours to be arranged.

Department Conference. The department staff and graduate students meet either weekly or fortnightly throughout the year for the review of new books and current periodicals and the presentation of original investigations.

UNIVERSITY REQUIREMENTS FOR THE DEGREES A.B. AND B. CHEM.

HYGIENE AND PREVENTIVE MEDICINE

All undergraduates are required to have a physical examination made in the University Medical Advisers' Offices each semester. Appointments for this examination must be made during the regular registration days at the beginning of each semester, even though examination may not be completed until late in the semester.

All students in the first two years of undergraduate courses are required to attend lectures on Hygiene and Preventive Medicine given once a week throughout the college year. The first year (Hygiene 1 and 2) is devoted to Personal Hygiene, Mental Hygiene, and First Aid. The second year (Hygiene 3 and 4) is devoted to Sanitation, Disease Prevention, and Group Hygiene.

MILITARY SCIENCE AND TACTICS

1. **Practical and Theoretical Training.** Throughout the year. Every able-bodied male student, a candidate for a baccalaureate degree, who is required to take five, six, seven, eight, or more terms in residence, must take in addition to the scholastic requirements for the degree, one, two, three, or four terms respectively in the Department of Military Science and Tactics. Three hours a week. Two hours on either M T W or Th, 3.15-5.15 p. m., as student may elect; and F. 4.45-5.45 p. m. *New York State Drill Hall.*

The requirements in Military Science and Tactics must be completed in the first terms of residence; otherwise the student will not be permitted to register again in the University without the consent of the University Faculty.

The course of training is that prescribed by the War Department as basic for Infantry and Field Artillery units (as elected) of Reserve Officers' Training Corps. The Infantry includes instruction in physical training, disciplinary drills, ceremonies, military courtesy, auxiliary weapons (machine guns, automatic rifles, 37 m/m guns, and trench mortars), indoor and outdoor rifle practice, pistol practice, topography and mapping, tent pitching and camp sanitation, signalling, bayonet combat, field engineering, field maneuvers, interior guard duty, fundamental principles in minor tactics and leadership. The Field Artillery includes instruction in organization of the battery, customs of the service, military courtesy and discipline, individual equipment, pistol practice, hippology, gunnery, signalling, physical training, equitation and horsemanship, topography and reconnaissance, and motors.

2. **Elective Military Training.** Throughout the year. Credit two hours a term. Hours by assignment. *New York State Drill Hall.*

This is the advanced course prescribed by the War Department for units of the Reserve Officers' Training Corps, and includes three hours each week in the performance of the duty of officer or non-commissioned officer with organizations undergoing the training given under course 1, and two hours each week of theoretical instruction in preparation for such duties. Prerequisite course 1.

Course 2 may be elected only by permission of the Dean of the College of Arts and Sciences, and the Professor of Military Science and Tactics, but credit for this course may not be counted toward the ninety hours required in this college (see page xi). To enjoy the benefits offered by the Federal Government the student must agree to continue the course for four terms, and to attend one summer camp having a duration of about six weeks.

PHYSICAL TRAINING FOR MEN

1. **For Freshmen Excused from Drill.** Throughout the year. Three periods a week. Class and squad work and prescribed exercises. Mr. AUER and assistants.

2. **For Sophomores Excused from Drill.** Throughout the year. Three periods a week. Class and squad work and prescribed exercises. Mr. AUER and assistants.

3. **For Juniors and Seniors.** Building up and corrective exercises as prescribed by the Medical Examiners as a result of the term's physical examination required of all students in the University. Mr. BURKE.

4. Boxing and wrestling instruction for a small fee, at hours to be arranged. Mr. FALLON and Mr. O'CONNELL.

5. Swimming instruction, 4 to 6 p. m., daily except Saturday. Mr. HARRINGTON.

PHYSICAL TRAINING FOR WOMEN

6. **For Freshmen.** Throughout the year. Three periods a week. Miss BATEMAN, Miss READ, Miss RYAN, Miss CANFIELD, and Miss CASHO.

7. **For Sophomores.** Throughout the year. Three periods a week. Miss BATEMAN, Miss READ, Miss RYAN, Miss CANFIELD, and Miss CASHO.

The work of the two years consists of outdoor games and exercises from the beginning of the year to Thanksgiving, and from Easter vacation to the end of the year. From Thanksgiving to Easter the work is in large part indoors, and consists of floor exercises, folk, aesthetic, and interpretive dancing, and indoor games, in all of which certain prescribed tests must be met at the end of each period. For further information as to the required work in physical training, see the handbook issued by the Department.

8. **For Juniors and Seniors.** Building up and corrective exercises as prescribed by the Medical Examiners as a result of the term's physical examination required of all students in the University. Miss CASHO.

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THE GRADUATE SCHOOL

Administration

Livingston Farrand, A.B., M.D., L.H.D., L.L.D., President.

Ralph Hayward Keniston, A.B., A.M., Ph.D., Dean.

For the convenient discussion of questions which chiefly concern those engaged in related fields of work, the members of the Faculty of the Graduate School are divided into six groups, as follows:

- A. Languages and Literatures.
- B. History, Political Science, Philosophy, Education.
- C. Mathematics, Astronomy, Physics, Chemistry, Geology, Physical Geography.
- D. Biological Sciences.
- E. Engineering, Architecture, Applied Physical Sciences.
- F. Science Departments, New York Medical College.

The General Committee of the Graduate School consists of five members at large, elected by the Faculty, and six members elected by the groups, one member being elected by each group, together with the Dean, who is *ex officio* chairman of the Committee.

GENERAL COMMITTEE OF THE GRADUATE SCHOOL

1923-24

Professor J. Q. Adams (at large)
Professor R. A. Emerson "
Professor W. A. Hurwitz "
Professor Ernest Merritt "
Professor Sutherland Simpson "

Professor C. S. Northup (Group A)
Professor Preserved Smith (Group B)
Professor Frederick Bedell (Group C)
Professor H. D. Reed (Group D)
Professor H. N. Ogden (Group E)
Professor C. R. Stockard (Group F)

The Dean, *Chairman, ex officio.*